

Work Assignment No. 6
MTA Agreement No. 15099-0300

Utica Avenue Transit Improvements Study

**Task 3 Deliverable:
Screening of Utica Ave Transit
Improvement Alternatives &
Evaluation of Investment
Package Options (IPOs)**

December 2020

Prepared for:



Submitted by:



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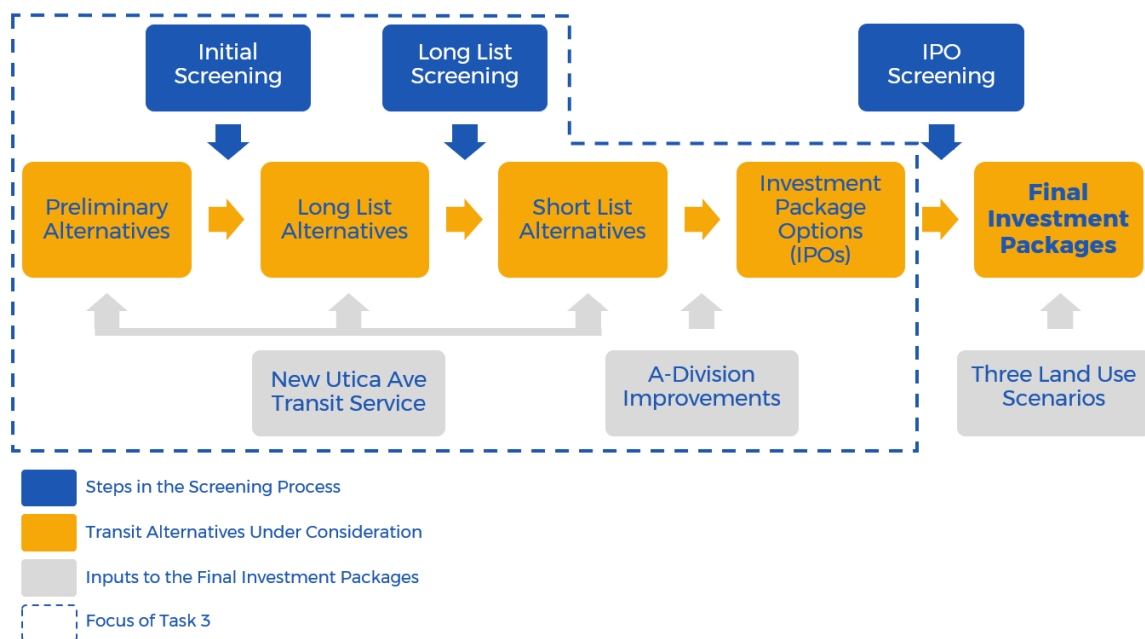
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1 Executive Summary

The purpose of the Utica Avenue Transit Improvements Study (Utica Ave Study) was to evaluate various modal and alignment options on Utica Ave and capacity improvements in the existing subway network—resulting in the selection of a set of Final Investment Packages for further consideration—to increase mobility and accessibility along, to, and from the Utica Ave corridor for a future horizon year 2035. This report presents the results of the screening of alternatives for a new Utica Ave transit service and the subsequent definition and evaluation of Investment Package Options (IPOs), setting the stage for the work in Tasks 4 and 5 to select Final Investment Packages. The alternatives development and screening process is shown on Figure ES1, with the work discussed in this report inside the dotted line.

Figure ES1: Alternatives Development & Screening Process



Source: Utica Ave Study

Note: The Task 3 work—documented in this report—covered the steps of the alternatives development and screening process inside the dotted line of this graphic. The subsequent steps of the process were documented in the deliverables for Tasks 4 and 5.

The screening of alternatives for a new Utica Ave transit service resulted in the identification of the Short List Alternatives. Thirteen IPOs were subsequently defined that built upon the Short List Alternatives and comprised a representative set of concepts for new transit service along Utica Ave paired with an associated A-Division operating plan (Table ES1).

Table ES1: Summary of Investment Package Options (IPOs)

New Utica Ave Transit Service		A-Division Operating Plan	
Mode	From/To	CBTC Baseline	Modified Hybrid
N/A	N/A	N/A	IPO #1
BRT	Kings Plaza - Woodhull Hospital	IPO #2	IPO #3
Subway (A-Division Extension)	Kings Plaza - Eastern Parkway (Local Track Connection)	IPO #4	IPO #5
	Kings Plaza - Eastern Parkway (Express Track Connection)	IPO #6	IPO #7
Subway (B-Division Shuttle)	Kings Plaza - Fulton Street (Shuttle) <i>(designed to not preclude a northward extension to Broadway)</i>	IPO #8	IPO #9
BRT & Subway (A-Division Extension)	BRT: Kings Plaza - Woodhull Hospital Subway: Church Av - Eastern Parkway (Local Track Connection) <i>(designed to not preclude a southward extension to Kings Plaza)</i>	IPO #10	IPO #11
	BRT: Kings Plaza - Woodhull Hospital Subway: Church Av - Eastern Parkway (Express Track Connection) <i>(designed to not preclude a southward extension to Kings Plaza)</i>	IPO #12	IPO #13

Source: Utica Ave Study

Notes:

- IPO #1, which would introduce the Modified Hybrid Operating Plan on the A-Division, included a package of improvements to existing A-Division infrastructure.
- All subway IPOs could be fully underground or transition to aerial.

Following the definition of the 13 IPOs, a set of quantitative and qualitative evaluation criteria—linked to the study goals and objectives—was established to inform the selection of Final Investment Packages from the IPOs. All of the evaluation criteria were important and collectively demonstrated the extent to which each IPO achieved the study goals and objectives against the baseline of the No-Build Alternative. There were 35 evaluation criteria in total, and a representative subset of the criteria was identified that would drive the recommendations for the Final Investment Packages.

The technical work to support the evaluation of the IPOs was completed in Task 3 (as documented in this report and the corresponding Appendices), and the selection of the Final Investment Packages was subsequently documented in Tasks 4 and 5, as follows:

- Task 4: ranking of IPOs #4-#7 based on the applicable evaluation criteria for comparing different operational scenarios of an A-Division Extension along Utica Ave from Eastern Parkway to Kings Plaza; and
- Task 5: selection of the Final Investment Packages as informed by the ranking of IPOs #4-#7 in Task 4, a targeted comparison of all 13 IPOs, and the intent to offer a range of investment levels and service concepts for the Utica Ave transit improvements. This task also included ridership forecasts for the Final Investment Packages paired with three potential future Land Use Scenarios.

2 Introduction

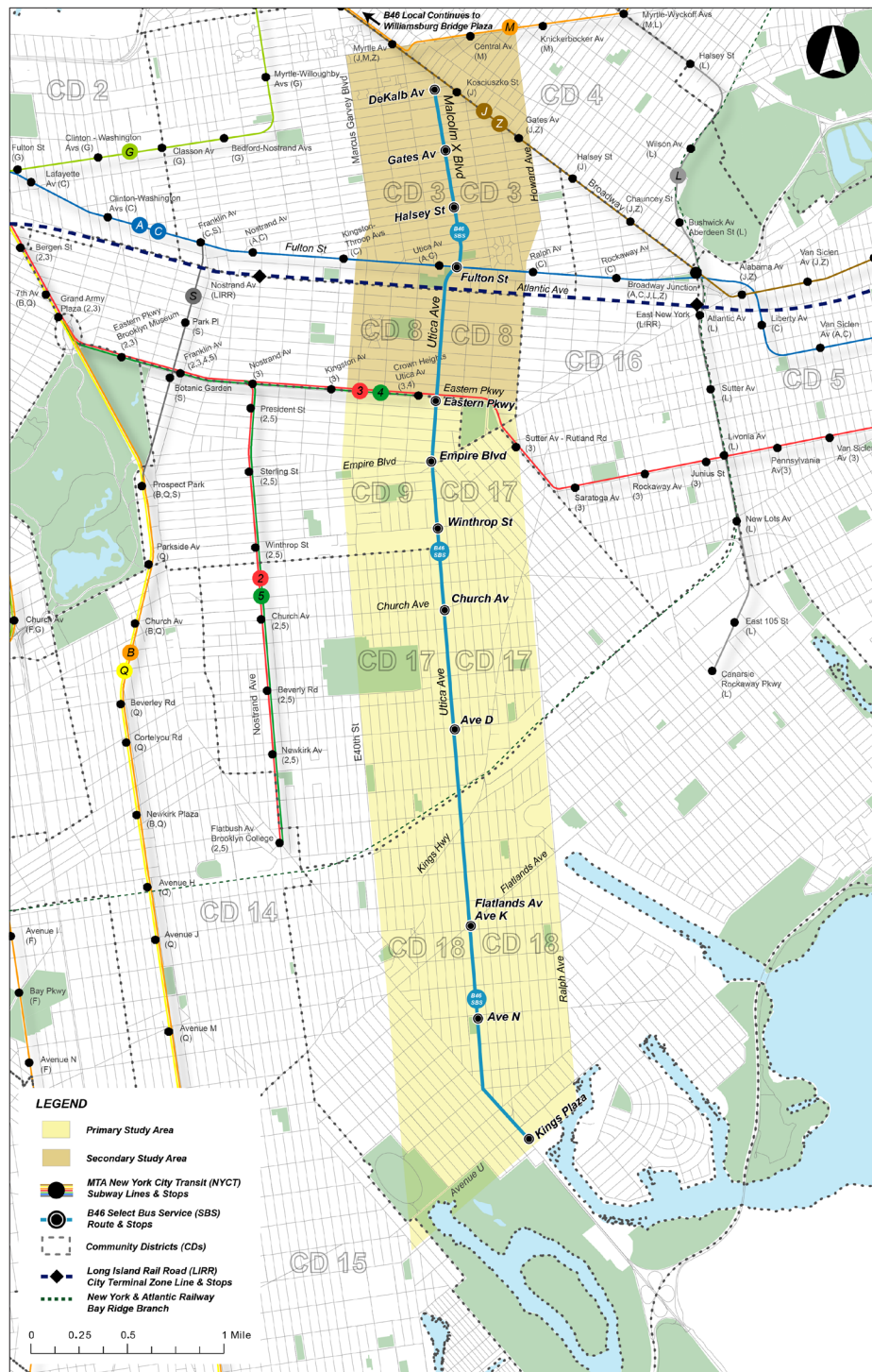
The purpose of the Utica Avenue Transit Improvements Study (Utica Ave Study) was to evaluate various modal and alignment options on Utica Ave and capacity improvements in the existing subway network—resulting in the selection of a set of Final Investment Packages for further consideration—to increase mobility and accessibility along, to, and from the Utica Ave corridor for a future horizon year 2035. Alternatives were defined in this study to address the need for transit improvements to increase reliability, reduce travel times, enhance connectivity, and accommodate future growth. In using an alternatives analysis process, the end product of the study was a set of Final Investment Packages corresponding to a range of service concepts and investment levels for transit improvements that addressed the study purpose and need and achieved the study goals and objectives.

This report presents the results of the screening of alternatives for a new Utica Ave transit service and the subsequent definition and evaluation of Investment Package Options (IPOs), setting the stage for the work in Tasks 4 and 5 to select Final Investment Packages.

3 Study Area

As shown on Figure 1, the Study Area for the Utica Ave Study extended from Avenue V in the south to Myrtle Avenue in the north, incorporating an approximately half-mile buffer around the Utica Ave corridor, which becomes Malcolm X Boulevard north of Fulton Street. The Study Area was divided into Primary and Secondary Study Areas. The Primary Study Area was bounded by Eastern Parkway to the north, Ralph Avenue to the east, Avenue V to the south, and East 40th Street to the west. This area served as the main focus in the study of options to improve transit service and mobility along the Utica Avenue corridor. A Secondary Study Area contained additional opportunities for transit improvements along the northern portion of the corridor, extending from the Primary Study Area's northern boundary to Myrtle Avenue, which is several blocks north of the terminus for the existing B46 Select Bus Service (SBS).

Figure 1: Utica Ave Study Area



Source: Utica Ave Study

4 Overview of Utica Ave Transit Improvement Alternatives

The transit improvement alternatives under consideration in this study included multiple options covering multiple modes for a new service along the Utica Ave corridor, plus consideration for targeted investments to the subway system that could enhance access to and from the corridor. Additionally, a No-Build Alternative was defined for comparative purposes. The following sections summarize the changes to the transportation network that comprised the No-Build Alternative and subsequently present an overview of the Build Alternatives for Utica Ave transit improvements.

4.1 NO-BUILD ALTERNATIVE¹

A No-Build Alternative was defined to include the existing and committed transportation facilities and services expected to exist in the future horizon year 2035, including Long Island Rail Road (LIRR) East Side Access, Metro-North Railroad Penn Station Access, and Phase 2 of the Second Avenue Subway.

The No-Build Alternative also included the installation of Communications-Based Train Control (CBTC) on the A-Division Lines (1 2 3 4 5 6 7) of the subway system. CBTC is considered more reliable than existing fixed-block signaling based on the metric of on-time performance (OTP).² Additionally, CBTC offers train dispatchers more accurate train location information, allows for closer spacing between trains, and has the potential to increase the number of trains running on each line because trains can be operated in Automated Train Operation mode, which reduces train performance variability among train operators. Using the Future Baseline CBTC Operating Plan from the A-Division Capacity Study (updated to reflect New York City Transit [NYCT] feedback for purposes of the Utica Ave Study), the No-Build Alternative in the Utica Ave Study featured improvements to station-to-station travel times and average headways due to the installation of CBTC.³

The No-Build Alternative also included a number of programmed capital improvements by the New York City Department of Transportation (NYC DOT) to enhance the existing B46 SBS service. The New York Metropolitan Transportation Council (NYMTC) Federal Fiscal Year (FFY) 2017-2021 Transportation

¹ Two noteworthy initiatives were excluded from the No-Build Alternative: Central Business District (CBD) Tolling and the Brooklyn Bus Network Redesign. In coordination with the Metropolitan Transportation Authority (MTA) and New York City Transit (NYCT), it was decided that at the time when the No-Build Alternative needed to be defined for purposes of this study, a single scenario was not yet finalized for CBD Tolling or the Brooklyn Bus Network Redesign.

² The Utica Ave Study “Task 1 Deliverable 1A: Baseline Subway Capacity” quantified the improvement to simulated end terminal OTP that would be possible for the 2 3 4 5 6 following the installation of CBTC on these A-Division Lines. Using a five-minute lateness threshold, the overall simulation showed a 68.1% OTP for the Existing Baseline condition (i.e., with fixed-block signaling) and a 98.6% OTP for the Future Baseline condition (i.e., with CBTC). Of note, the Future Baseline condition reflected tighter (shorter) scheduled run times so the improvement would be even more significant than the 98.6% versus 68.1% simulated OTP gain.

³ *Fast Forward: The Plan to Modernize New York City Transit* does not propose to install CBTC on the A-Division Lines east of Nevins Street Station in the first 10 years of plan implementation. However, NYCT’s A-Division Capacity Study included train operations simulation analyses with CBTC installed and active throughout the Brooklyn A-Division Lines. Furthermore, NYCT directed that the service plans and simulations to be performed as part of the Utica Ave Study should use the A-Division Capacity Study simulation models with CBTC as a basis for evaluation of the Utica Ave Study improvements. As such, the Utica Ave Study proceeded with CBTC as part of the No-Build Alternative.

Improvement Program (TIP) identified the following capital investments along Utica Avenue, several of which have already been completed:

- Construction of bus bulbs, stations, bus lane signage, neckdowns, and other pedestrian safety features to reduce travel time along Utica Avenue from Flatbush Avenue to Carroll Street;
- Upgrades to sidewalks and installation of new curb extensions, median extensions, pedestrian refuge islands, and pedestrian signals to increase pedestrian safety and transit accessibility at the intersection of Utica Avenue and Flatbush Avenue; and
- Implementation of a traffic signal priority (TSP) system to reduce bus travel time and make bus service more reliable along Utica Avenue.

In addition to ongoing capital improvements along the corridor, the No-Build Alternative also included recent changes to the vehicle fleet and service frequency of the B46 SBS, specifically the use of higher-capacity articulated buses along the B46 SBS route and modified headways that went into effect in January 2020. Also with respect to the bus system, the No-Build Alternative included the electrification of buses and associated changes to bus storage/maintenance facilities to accommodate an electric bus fleet.

Throughout the screening process, the No-Build Alternative served as a baseline for comparing the anticipated benefits and potential impacts of the Build Alternatives.

4.2 BUILD ALTERNATIVES

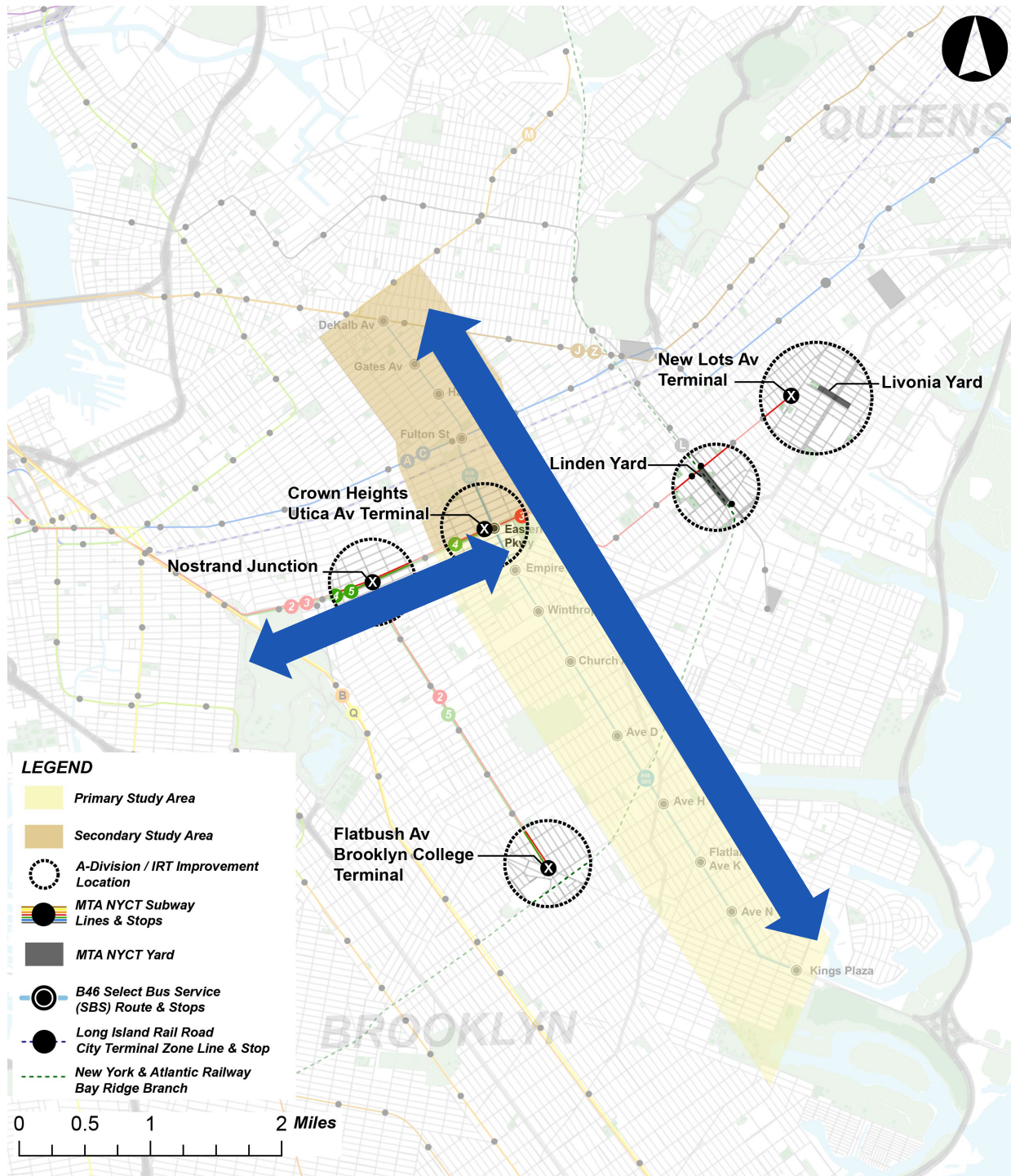
As depicted on Figure 2, Utica Ave transit improvements could come in two forms:

- Improving mobility along Utica Ave by introducing a new transit service to replace the existing B46 SBS; and
- Improving access to/from Utica Ave through targeted investments to the A-Division (while avoiding a degradation of other A-Division services in Brooklyn).

The Build Alternatives for the first type of transit improvement (i.e., along Utica Ave) included a number of different options for each of three transit modes: Bus Rapid Transit (BRT), Light Rail Transit (LRT), and subway.⁴ At the outset of the alternatives development process, a broad list of Preliminary Alternatives was defined for each mode, including combinations of potential northern and southern termini as well as variants based on operational/design characteristics. The relationship between modes, alternatives, and variants for the transit improvements along Utica Ave is shown for illustrative purposes on Figure 3.

⁴ At the outset of the study, a Transportation System Management (TSM) option was also under consideration, but was eliminated prior to the screening process. A TSM option would include a combination of relatively low-cost physical and/or operational improvements to increase reliability and reduce travel time for the B46 SBS, but would not introduce a new mode along the corridor. As such, a TSM option would essentially comprise a “No-Build Plus” condition, as it would add to the No-Build with targeted improvements to the B46 SBS. Given the extent of recent, ongoing, and forthcoming improvements to the B46 SBS along Utica Ave as noted in Section 4.1 (e.g., bump-outs, bus lane extensions, intersection-specific traffic reconfiguration, introduction of articulated buses, etc.), the No-Build condition already encompassed many improvements that would typically be included in TSM, and thus TSM was eliminated from consideration based on guidance from the study co-sponsors.

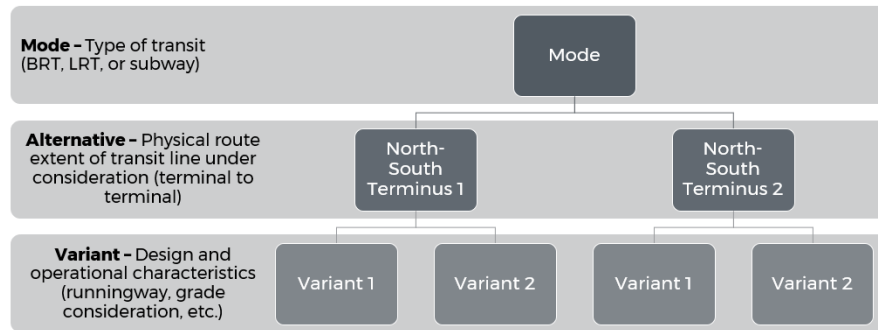
Figure 2: Opportunities for Transit Improvements Along and To/From Utica Ave



Source: Utica Ave Study

Note: Opportunities for transit improvements along and to/from Utica Ave are denoted by bold arrows

Figure 3: Relationship of Modes, Alternatives, and Variants (for Illustrative Purposes Only)



Source: Utica Ave Study

In addition to considering a range of alternatives for a new transit service along Utica Ave, the study identified options to improve transit access to/from Utica Ave by increasing the existing A-Division capacity and operational flexibility in eastern Brooklyn.⁵ This included opportunities along the Eastern Parkway, New Lots Avenue, and Nostrand Avenue Lines of the NYCT subway to alleviate existing constrained conditions pertaining to train operation bottlenecks and shortage of train storage or lay-up capability. The A-Division locations are shown on Figure 2 and correspond to Nostrand Junction, Flatbush Avenue Terminal, Crown Heights-Utica Avenue Station, New Lots Avenue Terminal, and Livonia and Linden Yards.

Both types of improvements (i.e., a new transit service along Utica Ave and targeted investments to the A-Division) could have independent utility by enhancing service along or to/from Utica Ave. The improvements could also be complementary, with possible synergies generating additional benefits, for instance with respect to travel time savings and ridership potential. As documented in subsequent task deliverables, the result of this study was the selection of Final Investment Packages, each of which could include one or both types of improvements. The remaining sections of this report document the process of defining and evaluating the different options for the Build Alternatives in Task 3, setting the stage for the subsequent selection of Final Investment Packages in Tasks 4 and 5.

⁵ As discussed in Section 5, the first several steps of the alternatives screening process focused on evaluating options for a new transit service along Utica Ave, followed by consideration of A-Division improvements.

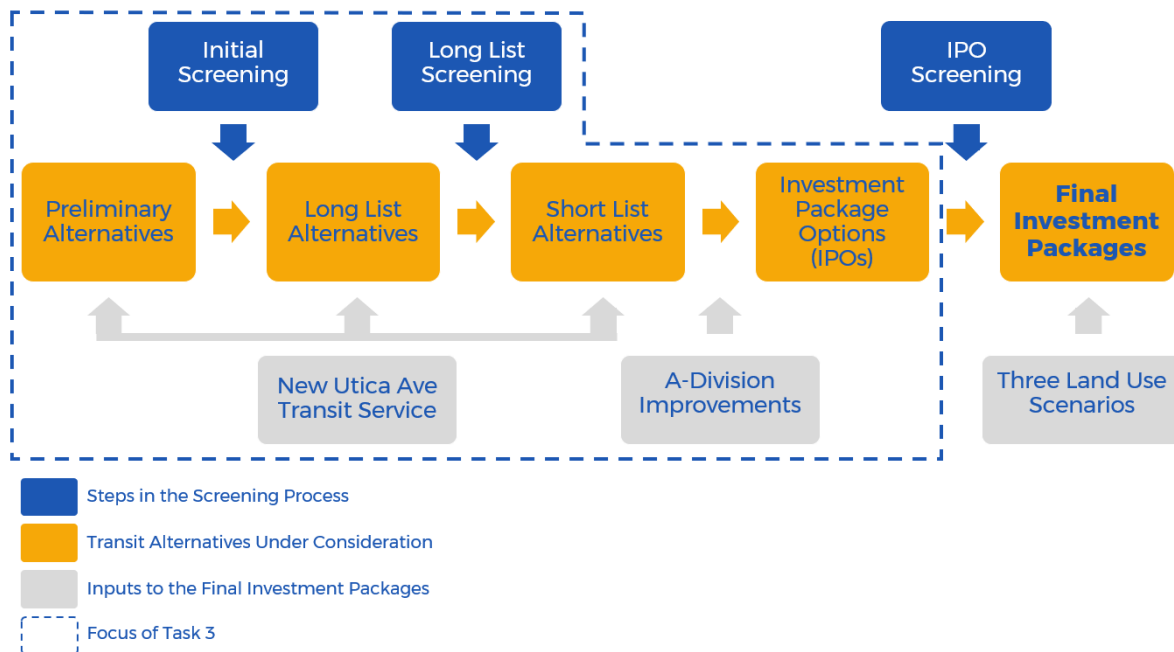
5 Overview of Screening Process

The Utica Ave Study included a multi-tiered screening process to evaluate the wide range of Build Alternatives under consideration for a new transit service along Utica Ave, ultimately leading to the identification of multiple Final Investment Packages—with consideration for complementary improvements to the A-Division—that met the study goals and objectives. The study goals and objectives provided the foundation for the evaluation of alternatives to achieve the purpose and need. The study goals were as follows:

1. Improve mobility and connectivity through the provision of new or enhanced transit options
2. Maximize consistency with local and regional plans
3. Enhance access to employment and activity centers and support economic growth
4. Maximize operational and cost effectiveness
5. Minimize adverse environmental impacts
6. Promote a resilient and redundant transit network

At each stage of the multi-tiered screening process, evaluation criteria were defined and applied to compare the extent to which the alternatives achieved the study goals and objectives. The alternatives development and screening process is shown on Figure 4, with the work discussed in this report inside the dotted line.

Figure 4: Alternatives Development & Screening Process



Source: Utica Ave Study

Note: The Task 3 work—documented in this report—covered the steps of the alternatives development and screening process inside the dotted line of this graphic. The subsequent steps of the process were documented in the deliverables for Tasks 4 and 5.

As depicted on Figure 4, the alternatives development and screening process resulted in the selection of a set of Final Investment Packages—including a new transit service along Utica Ave and/or improvements to the A-Division—paired with multiple Land Use Scenarios. The following process led to the selection of the Final Investment Packages:

- The first several steps of the alternatives development and screening process—documented in this report—included the definition and evaluation of a range of options for a new transit service along Utica Ave, which led to the identification of the Short List Alternatives, as follows:
 - The screening process started with the Initial Screening of Preliminary Alternatives for a new transit service along Utica Ave. Following the definition of the Preliminary Alternatives for BRT, LRT, and subway, the Initial Screening for each mode eliminated alternatives early in the process that did not adequately meet the study goals and objectives. The Initial Screening featured a two-step process for each mode: an evaluation of alternatives based on different northern/southern terminus locations, followed by an evaluation of preliminary operational/design variants, which were refined in subsequent stages of the screening process. The Initial Screening resulted in identification of the Long List Alternatives.
 - The Long List Screening subsequently included an assessment of the trade-offs of the remaining Long List Alternatives for a new transit service along Utica Ave. Similar to the Initial Screening, the Long List Screening was completed in multiple steps, including a comparison of the modes under consideration followed by an evaluation of mode-specific alternatives and operational/design variants. Whereas the Initial Screening was primarily a qualitative evaluation based on the basic attributes of the Preliminary Alternatives, the Long List Screening combined qualitative and quantitative evaluation criteria. The outcome of the Long List Screening was the identification of Short List Alternatives for a new transit service along Utica Ave.
- The next step in the alternatives development process—also documented in this report—was to pair the Short List Alternatives for a new Utica Ave transit service with A-Division improvements (and to consider A-Division improvements without a new transit service along Utica Ave), which were defined as Investment Package Options (IPOs). The selection of the Final Investment Packages—subsequent documented in Tasks 4 and 5—was informed by the screening of IPOs, which featured a targeted comparison of the IPOs using a subset of the evaluation criteria linked to the goals and objectives.
- Following the selection of the Final Investment Packages in Task 5, the ridership potential of each Final Investment Package was tested with three different Land Use Scenarios that corresponded to incremental increases in population and employment along the corridor in the 2035 horizon year.

Overall, while generally following an alternatives analysis process, the study did not identify a single locally preferred alternative (LPA), but rather a number of Final Investment Packages that reflected a range of investment levels and options for improving transit along, to, and from Utica Ave.⁶

⁶ As discussed in the Task 5 report, a targeted comparison of the 13 IPOs (using a subset of evaluation criteria linked to the study goals and objectives) demonstrated that while several differentiators emerged, no individual IPO performed the best across all metrics. As such, the comparison supported the outcome of this study as a set of Final Investment Packages as opposed to a single LPA. Refer to the Task 5 report for additional details.

6 Summary of Initial Screening of Preliminary Alternatives

The Preliminary Alternatives included several combinations of northern/southern termini as well as variants based on operational/design characteristics for each of three transit modes under consideration in the study: BRT, LRT, and subway. Following the definition of the Preliminary Alternatives, the Initial Screening—documented in a previous Task 3 report⁷—used a two-step process to advance alternatives that qualitatively met the goals and objectives applied at this first stage of the screening process. The result was identification of the Long List Alternatives—summarized in Table 1, with the prospect of additional variants to be subsequently defined—for more analysis in the Long List Screening.

Table 1: Outcome of Initial Screening – Identification of Long List Alternatives

Mode	Southern Terminus	Northern Terminus	Variants Under Consideration	Notes
BRT	Kings Plaza	DeKalb Av (with potential extension north along Broadway)	- At-grade transitway - Tunnel	- Center-running dedicated lanes south of Empire Blvd - Tunnel or transitway north of Empire Blvd - Potential to transition to mixed traffic at some point along the northern portion of the corridor
LRT	Kings Plaza	DeKalb Av (with potential extension north along Broadway)	- At-grade transitway - Tunnel	Same as above for BRT
A-Division Subway Extension	- Church Av - Kings Highway - Kings Plaza	Eastern Parkway (with service continuing on the A-Division)	Refer to Notes column	Variants such as specific alignments and operating plans would be subsequently defined at a later stage in this study
B-Division Subway Shuttle	Kings Plaza	Fulton Street	N/A	Designed to not preclude a northward extension to Broadway

Source: Utica Ave Study

In summary, the alternatives that were advanced beyond the Initial Screening included several design variants for both BRT and LRT that would provide service from Kings Plaza to DeKalb Av and possibly further north along Broadway; multiple options for an A-Division Subway Extension from Eastern Parkway; and a B-Division Subway Shuttle service⁸ from Fulton Street (designed so as to not preclude a potential northward extension to Broadway, which is discussed in greater detail in Appendix 1).

⁷ Refer to “Interim Task 3 Deliverable: Utica Ave Transit Alternatives – Screening Process & Initial Screening Results” for additional information about the Preliminary Alternatives and Initial Screening. It is important to note that the alternatives development and screening process evolved following completion of the Initial Screening, including—but not limited to—the definition and screening of IPOs.

⁸ As discussed in the Interim Task 3 Deliverable noted above, a subway extension from Fulton Street with through service would be fatally flawed due to capacity constraints. The Fulton Street Line does not have excess track and signal capacity between Hoyt-Schermerhorn Streets in Brooklyn and Canal Street in Manhattan (where the line winnows down from four tracks to two tracks), and even if CBTC is installed, any Utica Ave Extension would likely cut into service frequencies to the other southern terminals. As such, a subway extension from Fulton Street with through service was eliminated from consideration in the Initial Screening, and a subway shuttle alternative was advanced in this study as an option to provide subway service along Utica Ave to Fulton Street (with the prospect of a future northward extension to Broadway). The shuttle service would comprise an isolated line that would require customers to transfer to access A-Division or B-Division services (at Eastern Parkway or Fulton Street, respectively).

7 Long List Screening

7.1 LONG LIST SCREENING METHODOLOGY

As discussed in the previous section, the Initial Screening consisted of multiple tiers of evaluation—including a qualitative screening of alternatives and variants by mode—to narrow down the Preliminary Alternatives to a Long List. The subsequent Long List Screening similarly included several steps that collectively led to the identification of the Short List Alternatives that best met the study goals and objectives.

The first step in the Long List Screening was an evaluation of modes for a new transit service along Utica Ave, namely BRT, LRT, and subway. Following the elimination of LRT from consideration (as discussed in the next section), the next step in the Long List Screening included an evaluation of alternatives and variants for the remaining modes of BRT and subway. Each step of the Long List Screening featured a targeted evaluation using criteria that would drive the decision about what options to advance to the Short List. The following sections discuss those criteria that drove the decision, which included a combination of qualitative and quantitative criteria. Additional criteria were defined and applied to subsequently evaluate the IPOs.

7.2 LONG LIST SCREENING: MODES

7.2.1 Overview

The Long List Screening started with the evaluation of BRT, LRT, and subway as the three modes under consideration for a new transit service along Utica Ave. BRT would comprise full physical separation from traffic, thereby improving travel time for customers by avoiding problems that degrade SBS service (e.g., double parking and bus bunching). An example of BRT is the HealthLine in Cleveland. LRT would be similar to BRT with respect to operational characteristics, but would have different vehicles and propulsion technology. An example of LRT is the Hudson-Bergen Light Rail in New Jersey. The third modal option under consideration was subway, which could include the possibility of an extension from the existing Eastern Parkway Line or a shuttle service (with transfer required) from Fulton Street, as previously noted.⁹

The following section presents the results of the Long List Screening of modes, including a discussion of the evaluation criteria that drove the outcome (Table 2).

⁹ Subsequent sections of this report—as well as Appendices 2A and 2B—discuss alignment options for those modes that advanced beyond this tier of the screening process. This includes but is not limited to alignment options for a Utica Ave subway line to remain fully underground or transition to an aerial guideway.

Table 2: Evaluation Criteria for Long List Screening of Modes

Goal	Objective	Long List Screening Evaluation Criteria
Maximize consistency with local and regional plans	Maximize consistency with the strategy of <i>OneNYC</i> to prepare New York City for the future	Maximizes consistency with the goals and initiatives of <i>OneNYC</i>
	Maximize consistency with the <i>Fast Forward Plan to Modernize NYCT</i>	Maximizes consistency with the priorities in the <i>Fast Forward Plan</i>
Maximize operational and cost effectiveness	Make use of existing and planned transportation system services, capacity, and maintenance facilities	Maximizes use of existing and planned transportation system services, capacity, and maintenance facilities

Source: Utica Ave Study

7.2.2 Results

Criterion: Maximizes consistency with the goals and initiatives of *OneNYC*

OneNYC is the City of New York’s strategic plan to 2050, which features an expansive list of 30 initiatives to achieve eight goals in preparing for the future. One such initiative is to “modernize New York City’s mass transit networks” as a means of advancing the goal of promoting “efficient mobility.” Under this initiative, *OneNYC* identifies a number of actions to improve and expand the existing multi-modal transit system, including specific actions related to the subway and bus network.

Of note, *OneNYC* explicitly identifies the possibility of a Utica Ave subway extension as one of several opportunities for subway expansion. Additionally, *OneNYC* calls for an expansion of bus priority citywide to improve bus performance, with increased bus speed as a key metric. As previously noted, one of the principal benefits of BRT along Utica Ave would be to address the shortcomings that degrade existing SBS, and thus the introduction of BRT would directly support the initiative identified in *OneNYC*.

Whereas *OneNYC* promotes expansion of the subway network and bus priority, there is no comparable focus on the prospective benefits of LRT. While the introduction of LRT along Utica Ave would not be inconsistent with *OneNYC* (and would be broadly aligned with the intent to “provide New Yorkers with more transit options”), subway and BRT options are more directly consistent with the priorities discussed in *OneNYC*.

Criterion: Maximizes consistency with the priorities in the *Fast Forward Plan*

The *Fast Forward Plan* aims to modernize NYCT by advancing four priorities, two of which reflect the extent to which subway and BRT would be more closely aligned than LRT with the agency’s vision for the future. Specifically, whereas one priority is to “transform the subway” and another priority is to “reimagine the bus network,” there is not an analogous discussion of introducing a new mode to the transit system. While the *Fast Forward Plan* does not explicitly focus on potential Utica Ave transit improvements, it does identify the importance of increasing subway capacity as well as the opportunity to achieve improved travel times for the bus network. In this way, and similar to the *OneNYC* discussion above, LRT was an outlier among the modes under consideration for a new transit service along Utica Ave, with subway and BRT more directly consistent with the priorities in the *Fast Forward Plan*.

Criterion: Maximizes use of existing and planned transportation system services, capacity, and maintenance facilities

While all three modes under consideration would require major capital investment along the corridor, LRT would be unique as it would constitute a fundamentally different mode than any transit services currently operated by the MTA and/or the City of New York. The introduction of LRT along Utica Ave—as a completely new mode—would run counter to the criterion of maximizing use of existing and planned transportation system capacity and maintenance facilities, unlike subway or BRT.

For instance, a Utica Ave subway line (if an extension from Eastern Parkway) could benefit from the No-Build investment in CBTC on the A-Division, which would enable increased capacity and reduced travel time compared to the existing subway network. Additionally, while A-Division storage is constrained in Brooklyn, the fleet for a Utica Ave subway line would not require an entirely new yard/shop for storage/maintenance, and could benefit from storage capacity in the Bronx and/or other potential A-Division investments at Livonia or Linden Yards (discussed in Task 2), in addition to tail tracks at the southern terminus. Moreover, although additional fleet would be needed to provide the service along Utica Ave, the subway cars would be compatible with the overall A-Division fleet and could be shared among different lines as applicable.

Similar to a subway extension, the introduction of BRT along Utica Ave would enable opportunities to take advantage of assets that would be available in the No-Build condition. For example, the alternatives development process in this study assumed that BRT would replace the B46 SBS, and as such, the electric articulated buses used for the B46 SBS in the No-Build condition could be re-purposed for the BRT service. Additionally, it was assumed in this study that the buses used to provide BRT service would be stored and maintained at the Flatbush Bus Depot located on Utica Ave, thereby underscoring the extent to which BRT would maximize use of existing and planned capacity.¹⁰

Unlike subway and BRT, the introduction of LRT along Utica Ave would require additional investments specifically to accommodate this new mode. A new LRT system would require the procurement, acquisition, storage, maintenance, and operation of an entirely new fleet of equipment. Potential efficiencies associated with the fleet maintenance of a Utica Ave subway line or BRT (with respect to maintenance of the vehicles themselves as well as the facility in which the maintenance would take place) would not be possible with LRT, nor would it be possible to share parts because this would be a standalone system as opposed to part of a larger fleet network. The storage and maintenance of an LRT fleet would require a new yard and shop. Several potential locations for a yard and shop were considered in this study, and each option included shortcomings (e.g., location within the 100-year floodplain; insufficient space and/or suboptimal site geometry; etc.). The most promising option that was considered was the existing Flatbush Bus Depot, but this could require relocation of the depot.¹¹ Under such a scenario, and as a stark contrast to the BRT discussion

¹⁰ As previously noted, the No-Build Alternative included the electrification of buses and associated changes to bus storage/maintenance facilities to accommodate an electric bus fleet. Additionally, while not included in the No-Build Alternative due to the uncertain outcome of ongoing work, it was anticipated that the Brooklyn Bus Network Redesign would result in changes to bus routes and utilization of existing bus depots. Given the location of the Flatbush Bus Depot along Utica Ave, it would be efficient to use this depot for the storage and maintenance of a future BRT fleet to serve the corridor. This could result in the potential need to redistribute other buses to the Spring Creek, Ulmer Park, and/or East New York depots. Ultimately, the proposed depot assignments resulting from the Brooklyn Bus Network Redesign and electric-charging infrastructure designs would affect total capacity of each of the system's depots. As such, the storage and maintenance assumptions for a future Utica Ave BRT route should be revisited if such an alternative is advanced beyond this study.

¹¹ It could be theoretically possible to consider an option that combines LRT and bus operations on the site of the Flatbush Bus Depot by building one or more additional stories, but such an option was not explored in this study.

above, the introduction of LRT would not only fail to maximize use of an existing maintenance facility, but would actually displace such a facility.

There are also other shortcomings associated with LRT especially when compared with BRT. A BRT system would offer operating plan flexibility for the incorporation of feeder routes to use the dedicated lanes, thereby benefiting from the new infrastructure. In this way, BRT would leave potentially more leeway to accommodate and complement Bus Network Redesign planning than would LRT. Furthermore, a BRT system would have the flexibility to reroute buses from the dedicated lane into the general travel lane if required. In contrast, the fixed guideway nature of LRT vehicles would make it impossible to reroute off the track, which could be disruptive during unplanned circumstances such as a stalled rail vehicle event, and even during circumstances that are planned for in advance such as track reconstruction. As such, LRT would be more vulnerable to suspended operations than BRT. Additionally, LRT would also pose additional challenges due to potential vertical clearance constraints at the overhead bridges along Utica Ave at the Long Island Rail Road (LIRR) Bay Ridge Branch and at Atlantic Avenue.

It is also important to note that LRT would not be an extension of existing service. Although BRT would require a transfer to the subway, it is the least capital-intensive mode under consideration in the study. In comparison, LRT would require substantial investment along the corridor—including a trackbed system in the roadway and traction power throughout the route, in addition to a storage and maintenance facility—and would still require a transfer to connect to existing transit service. This is yet another way in which LRT would not maximize use of existing and planned transportation system services.

Summary

The outcome of the Long List Screening of modal options is shown in Table 3. In summary, LRT was eliminated from consideration at this step in the Long List Screening because unlike BRT and subway, the introduction of LRT on Utica Ave would not maximize consistency with *OneNYC* and the *Fast Forward Plan*, nor would it maximize use of existing and planned transportation system services, capacity, and maintenance facilities. As such, the subsequent steps in the Long List Screening focused on evaluating alternatives and variants for the remaining modes (i.e., BRT and subway).

Table 3: Outcome of Long List Screening of Modal Options

Mode	Outcome of Long List Screening of Modal Options
BRT	Advanced
LRT	Eliminated
Subway	Advanced

Source: Utica Ave Study

7.3 LONG LIST SCREENING: BRT ALTERNATIVES

7.3.1 Overview

After advancing BRT in the first step of the Long List Screening, the next step in the screening process focused on two decisions for the BRT alternatives: (1) the runningway design variant along Utica Ave north of Empire Boulevard; and (2) the northern terminus for the service. Based on the results of the Initial Screening, it was

determined that the southern terminus for all BRT alternatives would be Kings Plaza,¹² and that the runningway south of Empire Boulevard would be center-running dedicated lanes.

North of Empire Boulevard, two different design variants remained under consideration at the conclusion of the Initial Screening, namely an at-grade transitway and an underground tunnel (Figure 5). These design variants were identified as potential solutions to provide dedicated lanes for BRT in both directions within the more constrained right-of-way (ROW) along this northern portion of the corridor, which is characterized by a typical width of approximately 40' compared to the more generous typical width of 64' south of Empire Boulevard.

The evaluation criterion that drove the decision regarding the runningway variant north of Empire Boulevard (as discussed in the following section) is shown in Table 4.

Table 4: Evaluation Criteria for Long List Screening of BRT Runningway Variants North of Empire Boulevard

Goal	Objective	Long List Screening Evaluation Criteria
Maximize operational and cost effectiveness	Implement transit improvements whose capital and operating / maintenance (O&M) costs are warranted based on anticipated ridership	Minimizes capital cost relative to anticipated benefits for customers

Source: Utica Ave Study

In addition to the two options for the runningway design variant north of Empire Boulevard, three options for a northern terminus were considered in the Long List Screening for the BRT alternatives. The three potential locations were Dekalb Av, Myrtle Av, and Woodhull Hospital (Figure 6).

The evaluation criteria that drove the decision regarding the northern terminus (as discussed in the following section) are shown in Table 5.

Table 5: Evaluation Criteria for Long List Screening of BRT Northern Terminus

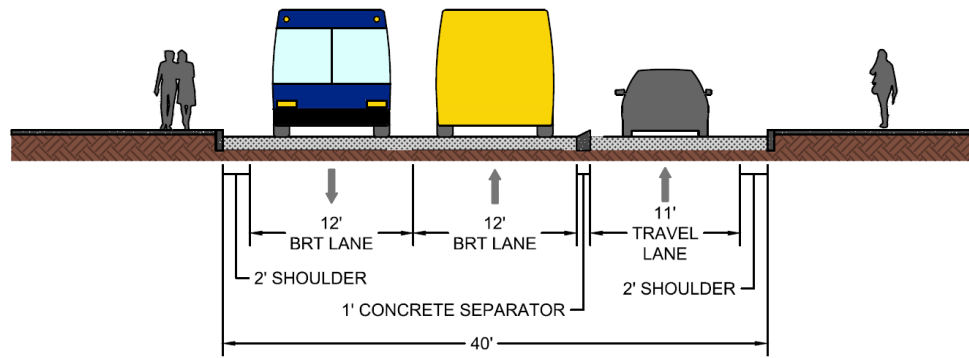
Goal	Objective	Long List Screening Evaluation Criteria
Improve mobility and connectivity through the provision of new or enhanced transit options	Provide direct service to key destinations and offer multi-modal connections with other transit services	Maximizes multi-modal connectivity
	Increase transit ridership	Maximizes ridership potential

Source: Utica Ave Study

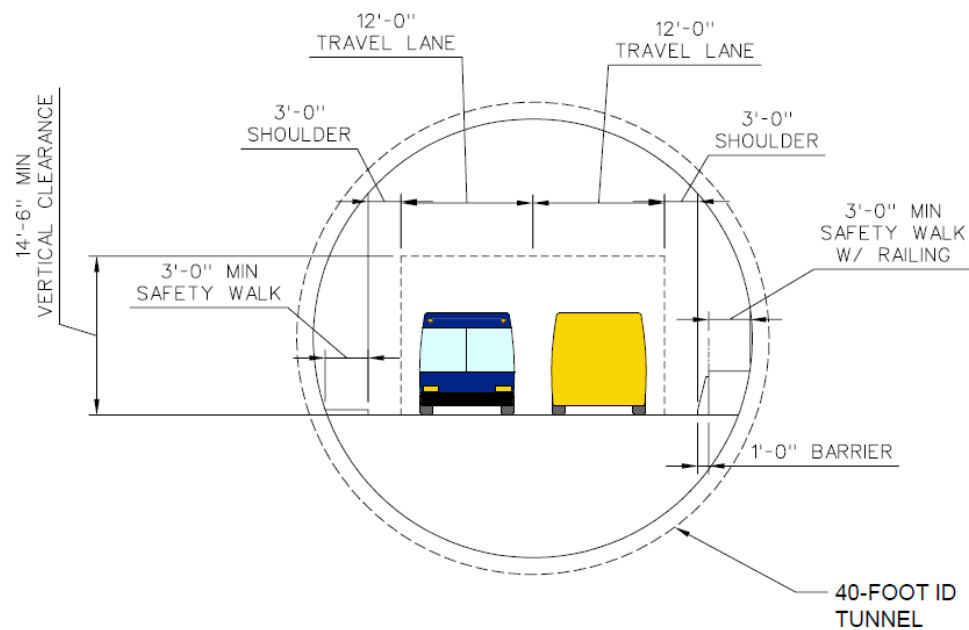
The following sections present the results of the Long List Screening of the BRT alternatives, starting with the evaluation of the runningway variants north of Empire Boulevard followed by the evaluation of the options for the northern terminus.

¹² As discussed in "Interim Task 3 Deliverable: Utica Ave Transit Alternatives – Screening Process & Initial Screening Results," and consistent with guidance provided by the Steering Committee, it was decided that any BRT alternatives would have Kings Plaza as the southern terminus and cover a service area at least as far north as Dekalb Av so as to avoid degrading service and forcing a transfer for current B46 SBS customers. As such, any BRT alternatives with a southern terminus north of Kings Plaza (and/or a northern terminus south of Dekalb Av) were eliminated from consideration in the Initial Screening because certain customers would have to make an additional transfer compared to options available in the No-Build Alternative.

Figure 5: BRT Runningway Design Variants North of Empire Boulevard



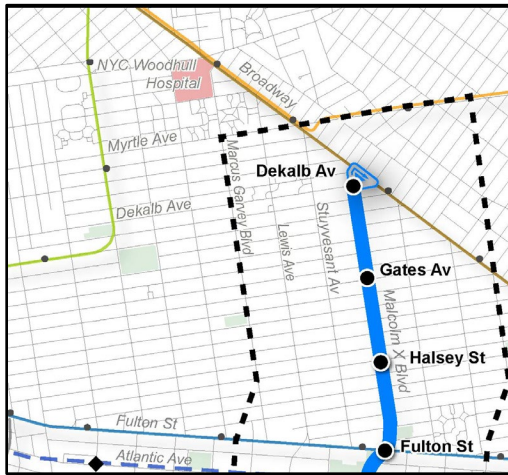
At-Grade Transitway Variant



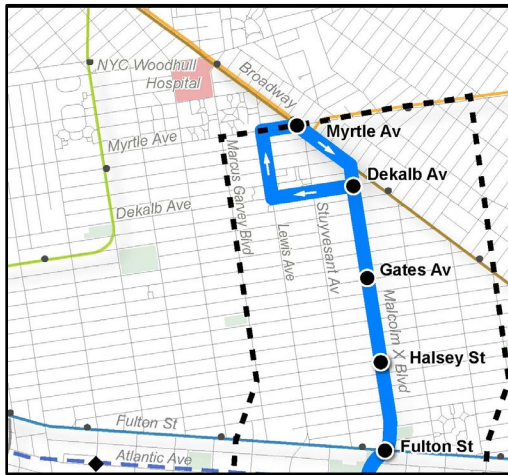
Underground Tunnel Variant

Source: Utica Ave Study

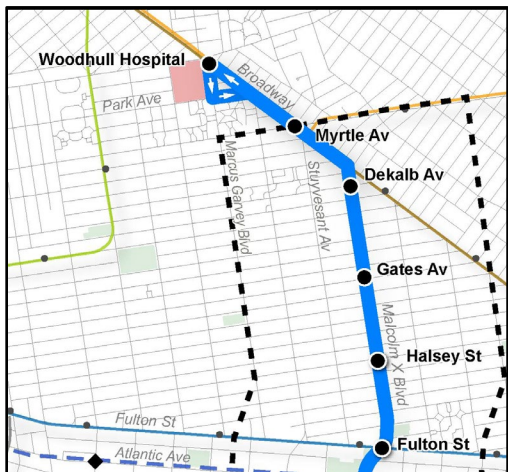
Figure 6: BRT Northern Terminus Options



Dekalb Av Terminus Option



Myrtle Av Terminus Option



Woodhull Hospital Terminus Option

Source: Utica Ave Study

7.3.2 Results

7.3.2.1 Results: BRT Runningway North of Empire Boulevard

Criterion: Minimizes capital cost relative to anticipated benefits for customers

While an underground tunnel would make it possible to accommodate BRT and preserve the current street configuration and traffic pattern (whereas an at-grade transitway would eliminate one direction of general purpose traffic along this portion of the corridor),¹³ an at-grade transitway would provide comparable operational benefits for the BRT service at a fraction of the cost. An underground tunnel would provide unimpeded BRT operation, but both runningway options would offer full physical separation from traffic, thereby achieving the intent of BRT to improve travel time for customers by avoiding problems that degrade SBS service. As such, an at-grade transitway would be a more cost-effective way to realize the operational improvements associated with a BRT service along Utica Ave, and the capital cost would render the tunnel option impractical.


Additionally, among those modes under consideration in this study for a new transit service along Utica Ave, BRT was intended to require the lowest level of capital investment, which would be negated by an underground tunnel alignment. The significant capital cost differential between the tunnel and transitway options, plus the fact that a tunnel alignment would also come with its own shortcomings (e.g., street-level impacts at the portal location and longer walking distance to transfer to the B46 Local), drove the decision to eliminate the tunnel option from consideration.

7.3.2.2 Results: BRT Northern Terminus

Criterion: Maximizes multi-modal connectivity

Each of the northern termini under consideration would offer transfer opportunities from the BRT to the Broadway Line of the NYCT subway, but would differ with respect to the convenience of the transfer and the number of locations at which to make the transfer. A northern terminus at Dekalb Av would match the current B46 SBS and offer a transfer via a two-block walk to the **J** at Kosciuszko St. Given the intent for the BRT to enhance service compared to the B46 SBS, this option for the northern terminus would not be ideal. A northern terminus at Myrtle Av would provide a direct connection to the **J M Z** at the Myrtle Av Station, offering a more direct transfer plus access to two additional subway lines compared to a northern terminus at Dekalb Av. Similarly, a terminus at Woodhull Hospital would build upon the connectivity benefits of the Myrtle Av option by also

¹³ A traffic analysis would be necessary in a subsequent design phase to determine the extent of potential impacts—and mitigation measures, if necessary—due to changes in vehicle circulation.

offering a transfer to the  at Flushing Av. Therefore, a northern terminus at Myrtle Av or Woodhull Hospital would offer superior connectivity compared to a northern terminus at Dekalb Av.

Criterion: Maximizes ridership potential

Based on the improved connectivity noted above, BRT service to either Myrtle Av or Woodhull Hospital would lend itself to greater potential ridership than service to Dekalb Av. In comparing the two northernmost options, Woodhull Hospital emerged as the preferred candidate for a northern terminus not only due to the additional transfer point to the Broadway Line, but also because the hospital is a key destination.

According to its website, Woodhull Hospital had more than 350,000 clinical visits in 2015, or more than 950 visits per day on average, and the hospital also offers three residency programs, indicative of its role as a destination not only for patients but also medical professionals as a place of employment. Of note, the 2019 Community Health Needs Assessment (CHNA) identified “quality care provided by Woodhull Hospital” as one of the community assets and “accessibility concerns for the aging population and those living with disabilities” as a challenge. The provision of BRT service to Woodhull Hospital could help to address these accessibility concerns and thereby increase ridership potential.

Currently, and in the No-Build condition, it would be necessary to either ride local bus service for the entire trip or transfer from the B46 SBS to the B46 Local to access Woodhull Hospital from the Utica Ave corridor. A BRT route that provided a direct connection from Utica Ave to both the Myrtle Av subway station and Woodhull Hospital would provide a clear benefit to customers compared to the B46 SBS, with the prospect of maximizing ridership potential. As such, Woodhull Hospital was advanced in the study as the northern terminus for BRT.

Summary

The outcome of the Long List Screening of BRT alternatives (Table 6) was the identification of an at-grade transitway as the preferred runningway option along Utica Ave north of Empire Boulevard (due to cost effectiveness compared to an underground tunnel), as well as the identification of Woodhull Hospital as the northern terminus for the service (due to maximizing multi-modal connectivity and ridership potential). Additionally, in coordination with the Steering Committee, it was decided that the transitway would extend at least as far north as Dekalb Av—rather than transitioning to mixed traffic at some point along the northern portion of the corridor—to ensure that BRT would constitute a transformative investment that is clearly distinguished from the B46 SBS. It was also decided that priority treatments between Dekalb Av and the northern terminus at Woodhull Hospital would be determined following the Long List Screening.

Table 6: Outcome of Long List Screening of BRT Alternatives

BRT Long List Alternatives		Outcome of Long List Screening of BRT Alternatives
Northern Terminus	Dekalb Av	Eliminated
	Myrtle Av	Eliminated
	Woodhull Hospital	Advanced
Runningway north of Empire Boulevard	At-grade transitway	Advanced
	Tunnel	Eliminated

Source: Utica Ave Study

7.4 LONG LIST SCREENING: SUBWAY ALTERNATIVES

7.4.1 Overview

After advancing subway as a modal option in the first step of the Long List Screening, the next step in the screening process focused on an evaluation of different operational scenarios for an A-Division Extension, including a combination of options for the track connection at Eastern Parkway and corresponding A-Division operating plan. It was decided with the Steering Committee that Kings Plaza would be advanced as the southern terminus for the operational variants of an A-Division Extension to test the upper bounds of potential ridership, while reserving the possibility of considering a different southern terminus (perhaps paired with other transit improvement alternatives) when defining the Investment Packages later in the study. Additionally, it was decided with the Steering Committee that the B-Division Shuttle would be advanced to the Short List Alternatives to test ridership potential for a Utica Ave subway line to Fulton Street, and that both the fully underground and aerial guideway alignment options would remain under consideration for all subway alternatives.

Given these decisions made in coordination with the Steering Committee, the Long List Screening for the subway alternatives included a targeted assessment of four A-Division operating plans each paired with a Local Track Connection and Express Track Connection at the existing Crown Heights-Utica Av Station (Figure 7). As shown in Table 7, each of the resultant eight operational scenarios included a different split of peak trains per hour (TPH) by line and terminal for the Brooklyn A-Division.

Table 7: A-Division Subway Operating Plans for Long List Alternatives

Alternative	Operating Plan (A-Division Improvement from Task 2)			
	CBTC Baseline (from A-Division Capacity Study)	Reorientation (Nostrand Junction Infrastructure Improvement)	Hybrid (Nostrand Junction Infrastructure Improvement)	Modified Hybrid (Crown Heights-Utica Av Station Infrastructure Improvement)
A-Division Extension Local Track Connection	2 5 to Flatbush (20 TPH) 3 to Kings Plaza (13 TPH) 4 to New Lots (23 TPH)	2 3 to Flatbush (30 TPH) 5 to Kings Plaza (10 TPH) 4 to New Lots (20 TPH)	2 3 to Flatbush (24 TPH) 5 8 to Kings Plaza (16 TPH) 4 to New Lots (20 TPH)	2 3 to Flatbush (24 TPH) 5 8 to Kings Plaza (16 TPH) 4 to New Lots (20 TPH)
A-Division Extension Express Track Connection	2 5 to Flatbush (20 TPH) 4 to Kings Plaza (23 TPH) 3 to New Lots (13 TPH)	2 3 to Flatbush (30 TPH) 4 to Kings Plaza (20 TPH) 5 to New Lots (10 TPH)	2 3 to Flatbush (24 TPH) 4 to Kings Plaza (20 TPH) 5 8 to New Lots (16 TPH)	2 3 to Flatbush (24 TPH) 4 to Kings Plaza (20 TPH) 5 8 to New Lots (16 TPH)

Source: Utica Ave Study

Notes:

- Refer to the "Task 3 Technical Memorandum: Network Modeling of A-Division Improvements and Utica Avenue Subway Extension" for schematic track diagrams of the respective operating plans.
- Hybrid and Modified Hybrid Operating Plans would introduce a new **8** line to enable the West Side IRT to continue providing some service to New Lots Av Terminal (for Express Track Connection) or provide service to Kings Plaza (for Local Track Connection).
- It was subsequently decided with NYCT that the split of TPH by line and terminal would be modified for purposes of the ridership forecasts.

The following section presents the results of the Long List Screening of A-Division operating plans, including a discussion of the evaluation criterion that drove the outcome (Table 8).

Table 8: Evaluation Criteria for Long List Screening of Subway A-Division Operating Plans

Goal	Objective	Long List Screening Evaluation Criteria
Maximize operational and cost effectiveness	Implement transit improvements whose capital and operating / maintenance (O&M) costs are warranted based on anticipated ridership	Minimizes capital cost relative to anticipated benefits for customers

Source: Utica Ave Study

7.4.2 Results

Criterion: Minimizes capital cost relative to anticipated benefits for customers

As detailed in a separate Task 3 technical memorandum,¹⁴ the Reorientation and Hybrid Operating Plans offer comparable operational benefits to the Modified Hybrid Operating Plan with respect to overall Brooklyn A-Division capacity and terminal on-time performance. However, the Reorientation and Hybrid Operating Plans would require a major capital investment at Nostrand Junction in the order of [REDACTED], whereas the Modified Hybrid Operating Plan would be enabled by a much more modest investment of [REDACTED] through the installation of a new diamond crossover north of Crown Heights-Utica Av Station. As such, for both an Express Track Connection and Local Track Connection at Eastern Parkway for the A-Division Extension, the Reorientation and Hybrid Operating Plans were eliminated from consideration as less cost-effective options to achieve similar benefits made possible by the Modified Hybrid Operating Plan. It was deemed premature to eliminate the CBTC Baseline Operating Plan from consideration at this stage of the study (for either the Express Track Connection or Local Track Connection at Eastern Parkway).

Summary

The outcome of the Long List Screening for the subway alternatives was the elimination of two operating plans from consideration on the grounds of cost effectiveness. In comparing the infrastructure investments that would be required to enable the respective operating plans, the Modified Hybrid Operating Plan would achieve similar operational benefits at a fraction of the capital cost relative to the Reorientation and Hybrid Operating Plans. As such, the latter two operating plans were not advanced beyond the Long List Screening. In addition to the Modified Hybrid Operating Plan, the CBTC Baseline Operating Plan (for both the Express Track Connection and Local Track Connection) was advanced to the Short List for additional analysis (Table 9).

¹⁴ Refer to “Task 3 Technical Memorandum: Network Modeling of A-Division Improvements and Utica Avenue Subway Extension” for additional information.

Table 9: Outcome of Long List Screening of Subway A-Division Operating Plans

A-Division Operating Plan	Outcome of Long List Screening of Subway A-Division Operating Plans
CBTC Baseline	Advanced
Reorientation	Eliminated
Hybrid	Eliminated
Modified Hybrid	Advanced

Source: Utica Ave Study

7.5 LONG LIST SCREENING RESULTS: IDENTIFICATION OF SHORT LIST ALTERNATIVES

The outcome of the multi-tiered Long List Screening was the identification of six Short List Alternatives (to supplement the No-Build Alternative), as follows:

- One BRT alternative from Kings Plaza to Woodhull Hospital – with dedicated center-running lanes south of Empire Boulevard, an at-grade transitway north of Empire Boulevard to DeKalb Avenue, and priority treatments to be determined between Dekalb Avenue and Woodhull Hospital.
- Four A-Division Extension alternatives from Kings Plaza to Eastern Parkway (with service continuing along the A-Division) – two options for the track connection at Crown Heights-Utica Av Station (i.e., Express Tracks and Local Tracks), each with two options for the corresponding A-Division operating plan (i.e., CBTC Baseline and Modified Hybrid).
- One B-Division Shuttle alternative from Kings Plaza to Fulton Street (with transfer required to access service on either the Eastern Parkway Line or Fulton Street Line) – designed not to preclude a future extension northward to Broadway.

As previously noted, all of the subway alternatives could remain fully underground or transition to an aerial guideway. Appendices 2A and 2B include alignment descriptions and representative concept plans for the Short List Alternatives, including but not limited to a summary of different options for the track connection and vertical alignment of a Utica Ave subway line.

As discussed in the following section, the next step in the alternatives development process included consideration for A-Division improvements in conjunction with the Short List Alternatives for a new transit service along Utica Ave, collectively framed as Investment Package Options (IPOs).

8 From Short List Alternatives to Investment Package Options (IPOs)

8.1 METHODOLOGY AND DEFINITION OF IPOs

The process of defining a set of IPOs was driven by the fact that different operating plans for the A-Division—dependent in part on A-Division infrastructure¹⁵—would have different implications for the ridership potential of a new transit service along Utica Ave. As such, the IPOs were defined to facilitate an evaluation of forecasted ridership, which was identified as a key criterion that would inform the eventual selection of the Final Investment Packages. Additionally, the ridership potential of the IPOs would also depend in part on the underlying population and employment assumptions along Utica Ave, which varied among the three Land Use Scenarios under consideration in the study.

Therefore, the methodology for defining and evaluating the ridership potential of the IPOs included the following steps:

- Define a range of IPOs with consideration for both a new transit service along Utica Ave and A-Division improvements, with the former based on the Short List Alternatives and the latter represented in the ridership model by an A-Division operating plan;
- Run the ridership model for each IPO using Land Use Scenario #2, which corresponded to the scenario with a moderate increase in population and employment (i.e., compared to both Land Use Scenario #1, which comprised the base scenario with the population and employment forecasts adopted by NYMTC for the 2035 horizon year, and Land Use Scenario #3, which represented the highest increase in population and employment among the three scenarios);¹⁶
- Select the Final Investment Packages from the broader list of IPOs, with the selection informed by multiple evaluation criteria including but not limited to ridership (as discussed in Section 9); and
- Run the ridership model for each of the Final Investment Packages using Land Use Scenario #1 and Land Use Scenario #3 to test ridership potential using different assumptions for population and employment.

¹⁵ As discussed in the following section, A-Division infrastructure improvements would be required to enable the Modified Hybrid Operating Plan.

¹⁶ Refer to “Task 1 Deliverables 3-5: Model Validation, Land Use Scenarios & Demand Forecasts” for additional details about the three Land Use Scenarios.

In total, 13 IPOs were defined that built upon the Short List Alternatives and comprised a representative set of concepts for new transit service along Utica Ave paired with an associated A-Division operating plan (Table 10).¹⁷ Table 11 presents the A-Division operating plan—and specifically the split of peak TPH by line and terminal—for each of the 13 IPOs, and the options for new service along Utica Ave are shown on Figure 8 through Figure 11. Operational details of each IPO are included in Appendix 3.

Table 10: Summary of Investment Package Options (IPOs)

New Utica Ave Transit Service		A-Division Operating Plan	
Mode	From/To	CBTC Baseline	Modified Hybrid
N/A	N/A	N/A	IPO #1
BRT	Kings Plaza - Woodhull Hospital	IPO #2	IPO #3
Subway (A-Division Extension)	Kings Plaza - Eastern Parkway (Local Track Connection)	IPO #4	IPO #5
	Kings Plaza - Eastern Parkway (Express Track Connection)	IPO #6	IPO #7
Subway (B-Division Shuttle)	Kings Plaza - Fulton Street (Shuttle) <i>(designed to not preclude a northward extension to Broadway)</i>	IPO #8	IPO #9
BRT & Subway (A-Division Extension)	BRT: Kings Plaza - Woodhull Hospital Subway: Church Av - Eastern Parkway (Local Track Connection) <i>(designed to not preclude a southward extension to Kings Plaza)</i>	IPO #10	IPO #11
	BRT: Kings Plaza - Woodhull Hospital Subway: Church Av - Eastern Parkway (Express Track Connection) <i>(designed to not preclude a southward extension to Kings Plaza)</i>	IPO #12	IPO #13

Source: Utica Ave Study

Notes:

- IPO #1, which would introduce the Modified Hybrid Operating Plan on the A-Division, included a package of improvements to existing A-Division infrastructure.
- All subway IPOs could be fully underground or transition to aerial.

¹⁷ As discussed below, IPO #1 was unique among the 13 IPOs in that it corresponded to A-Division improvements only, supplementing the B46 SBS without introducing a new transit service along Utica Ave.

Table 11: A-Division Operating Plan for the 13 IPOs

IPO #	Description	Peak Trains Per Hour (TPH) by Line and Southern Terminal (for Brooklyn A-Division)				Total TPH, All Lines & Terminals
		To Flatbush Av	To Crown Heights-Utica Av	To Kings Plaza (or Church Av)	To New Lots Av	
- No-Build - IPO #2 - IPO #8	No-Build Alternative for A-Division (CBTC Baseline Operating Plan <i>without</i> an A-Division Extension)	②: 13 TPH ⑤: 7 TPH (Total: 20 TPH)	④: 13 TPH ⑤: 6 TPH (Total: 19 TPH)*	N/A	③: 13 TPH (Total: 13 TPH)	52 TPH*, **
- IPO #1 - IPO #3 - IPO #9	A-Division Improvements <i>without</i> an A-Division Extension (Modified Hybrid Operating Plan <i>without</i> an A-Division Extension)***	②: 12 TPH ③: 12 TPH (Total: 24 TPH)	④: 20 TPH (Total: 20 TPH)	N/A	⑤: 10 TPH ⑧: 6 TPH (Total: 16 TPH)	60 TPH
- IPO #4 (to Kings Plaza) - IPO #10 (to Church Av)	A-Division Extension Build Alternatives	Local Track Connection with CBTC Baseline Operating Plan	②: 13 TPH ⑤: 7 TPH (Total: 20 TPH)	N/A	③: 13 TPH (Total: 13 TPH)	56 TPH
- IPO #6 (to Kings Plaza) - IPO #12 (to Church Av)		Express Track Connection with CBTC Baseline Operating Plan	②: 13 TPH ⑤: 7 TPH (Total: 20 TPH)	N/A	④: 23 TPH (Total: 23 TPH)	56 TPH
- IPO #5 (to Kings Plaza) - IPO #11 (to Church Av)		Local Track Connection with Modified Hybrid Operating Plan***	②: 12 TPH ③: 12 TPH (Total: 24 TPH)	N/A	④: 7 TPH ⑤: 10 TPH ⑧: 6 TPH (Total: 23 TPH)	60 TPH
- IPO #7 (to Kings Plaza) - IPO #13 (to Church Av)		Express Track Connection with Modified Hybrid Operating Plan***	②: 12 TPH ③: 12 TPH (Total: 24 TPH)	N/A	④: 20 TPH ⑤: 3 TPH (Total: 23 TPH)*	60 TPH

Source: Utica Ave Study

Notes:

*This table shows the TPH by line and southern terminal for the ridership forecasts. Below is a summary of differences from the rail simulations:

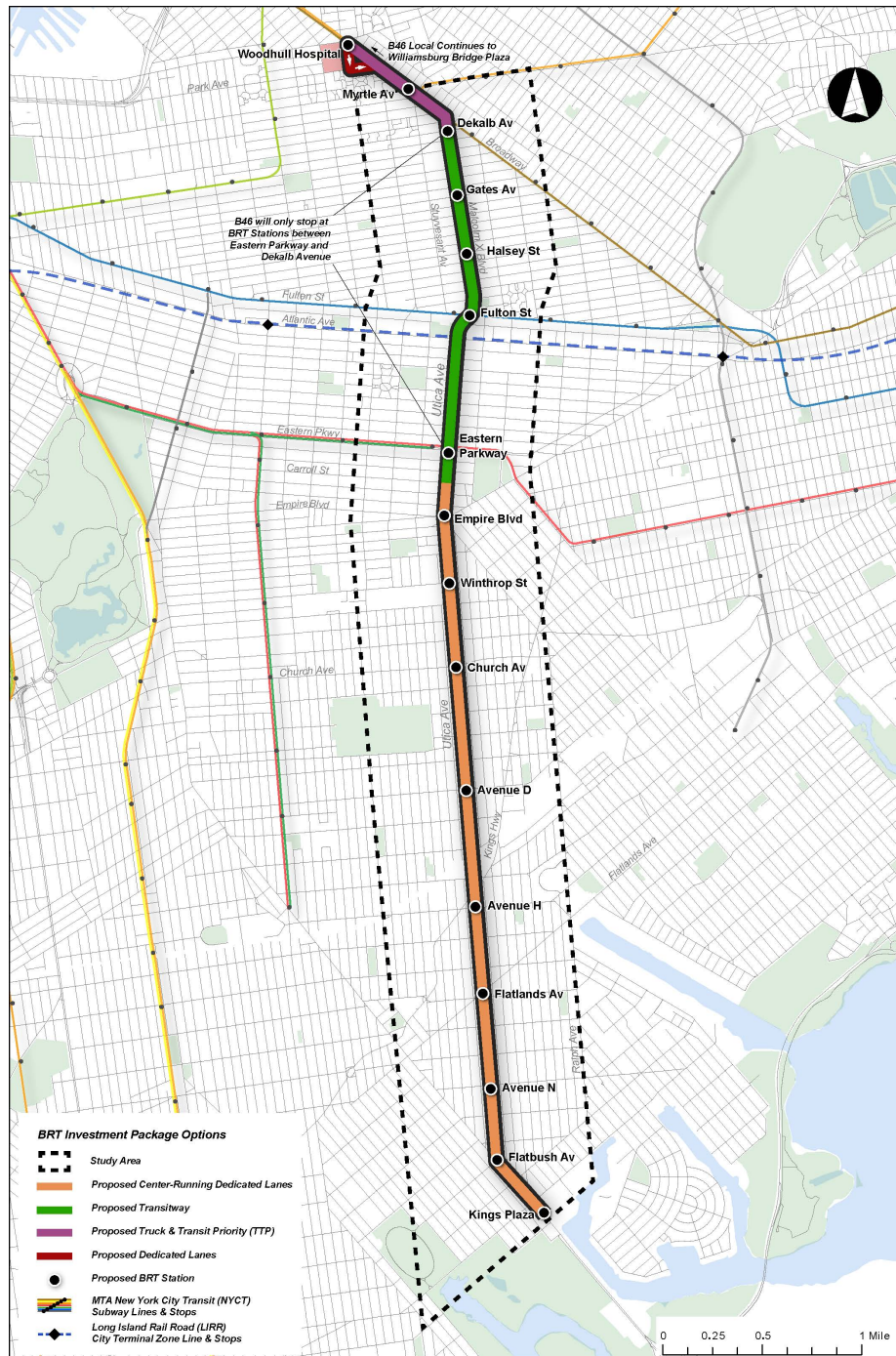
-No-Build Alternative: To Crown Heights-Utica Av = 23 TPH for ④ and 0 TPH for ⑤ (total 23 TPH); Total TPH, All Lines & Terminals = 56 TPH

-IPO #7: To Kings Plaza (or Church Av) = 20 TPH for ④ and 0 TPH for ⑤ (total 20 TPH); To New Lots Av = 10 TPH for ⑤ and 6 TPH for ⑧ (total 16 TPH)

** An additional 3 TPH combined for the East Side IRT would terminate in Manhattan (with the Bronx - Bowling Green short-turn) for the No-Build Alternative.

***The Modified Hybrid Operating Plan would introduce a new ⑧ line to enable the West Side IRT to continue providing some service to New Lots Av Terminal (for the Express Track Connection) or provide service along Utica Ave (for the Local Track Connection).

Figure 8: IPOs #2 - #3: BRT Along Utica Ave



Source: Utica Ave Study

Figure 9: IPOs #4 - #7: A-Division Extension Along Utica Ave

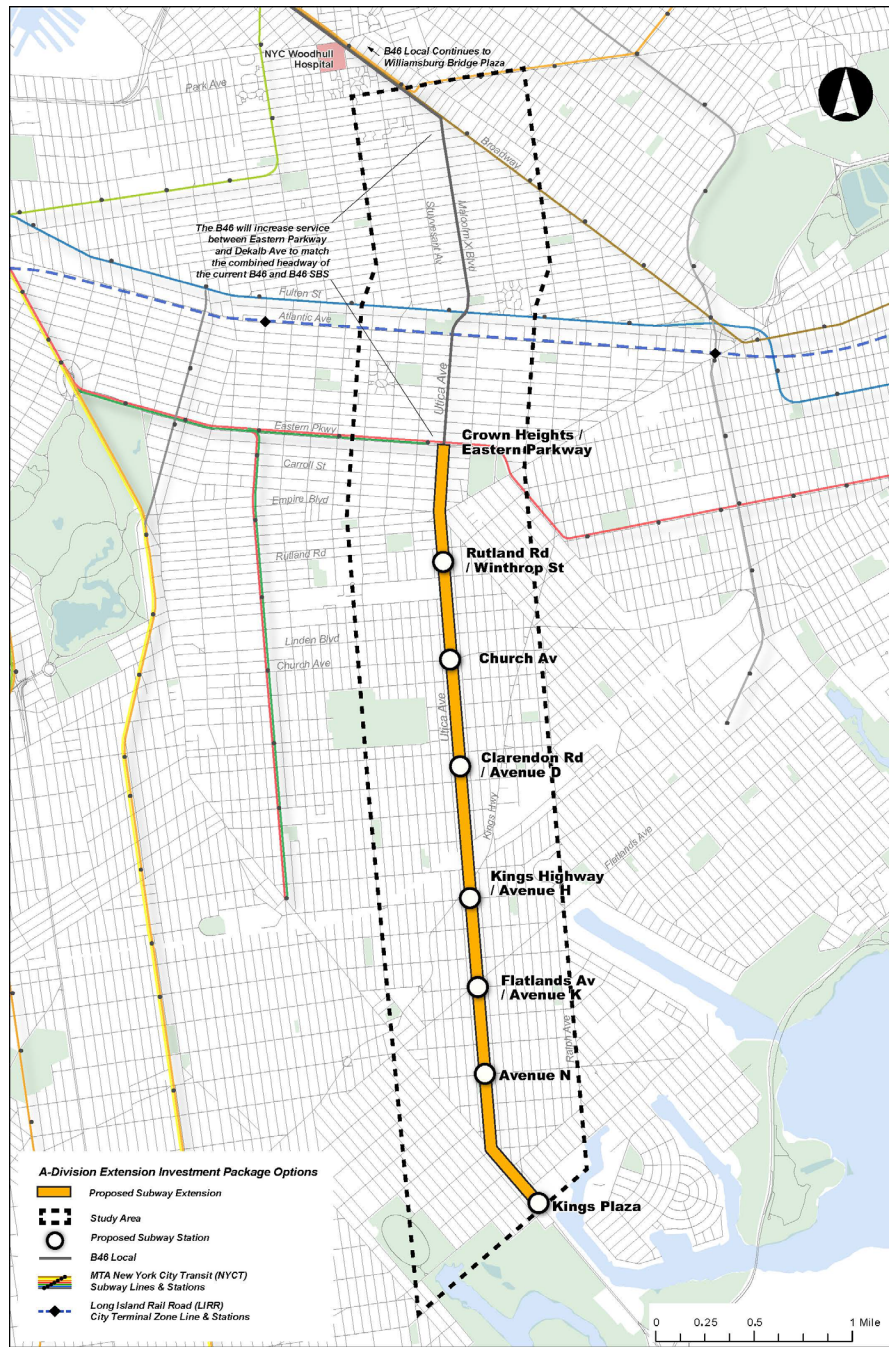
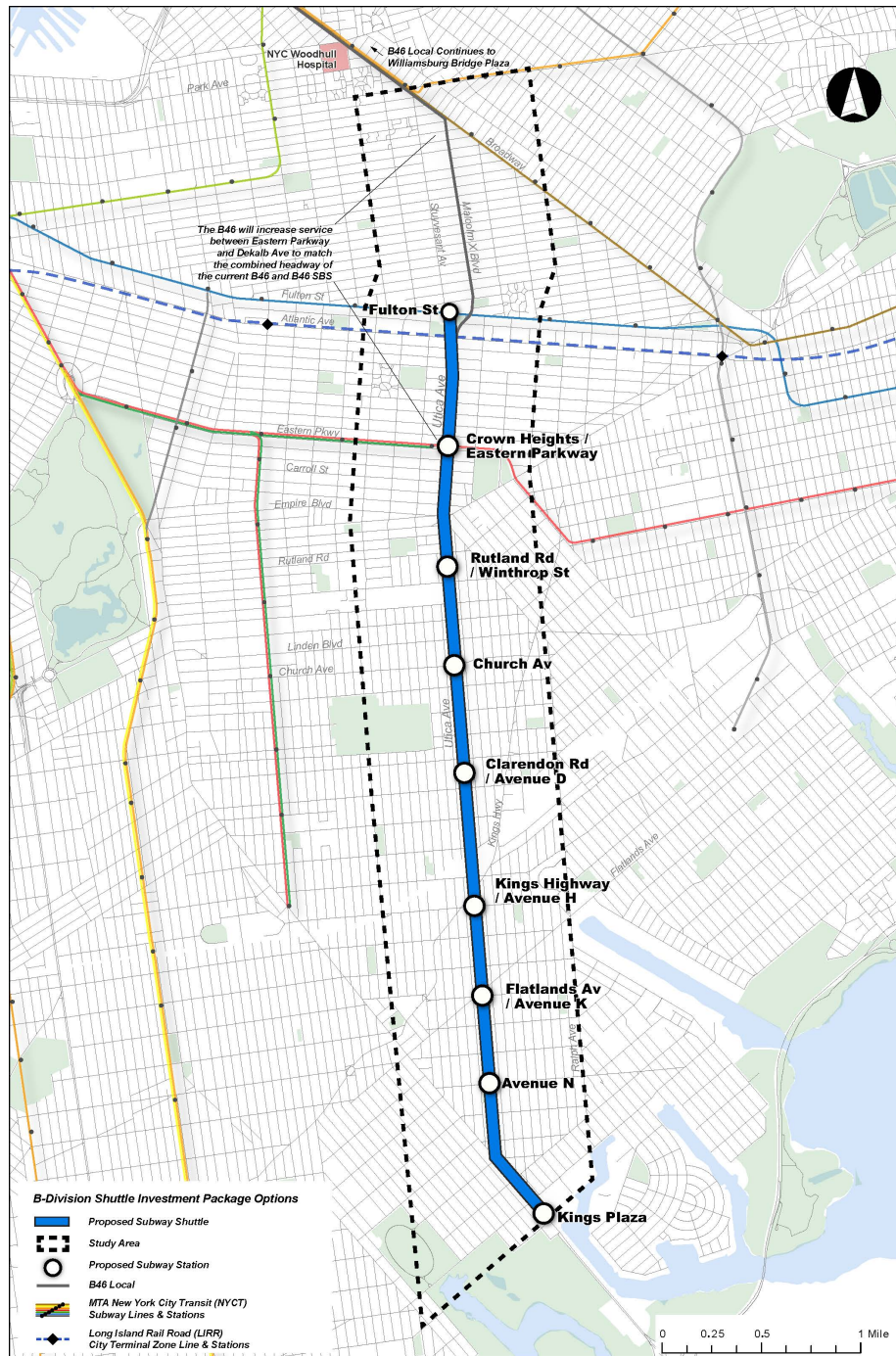


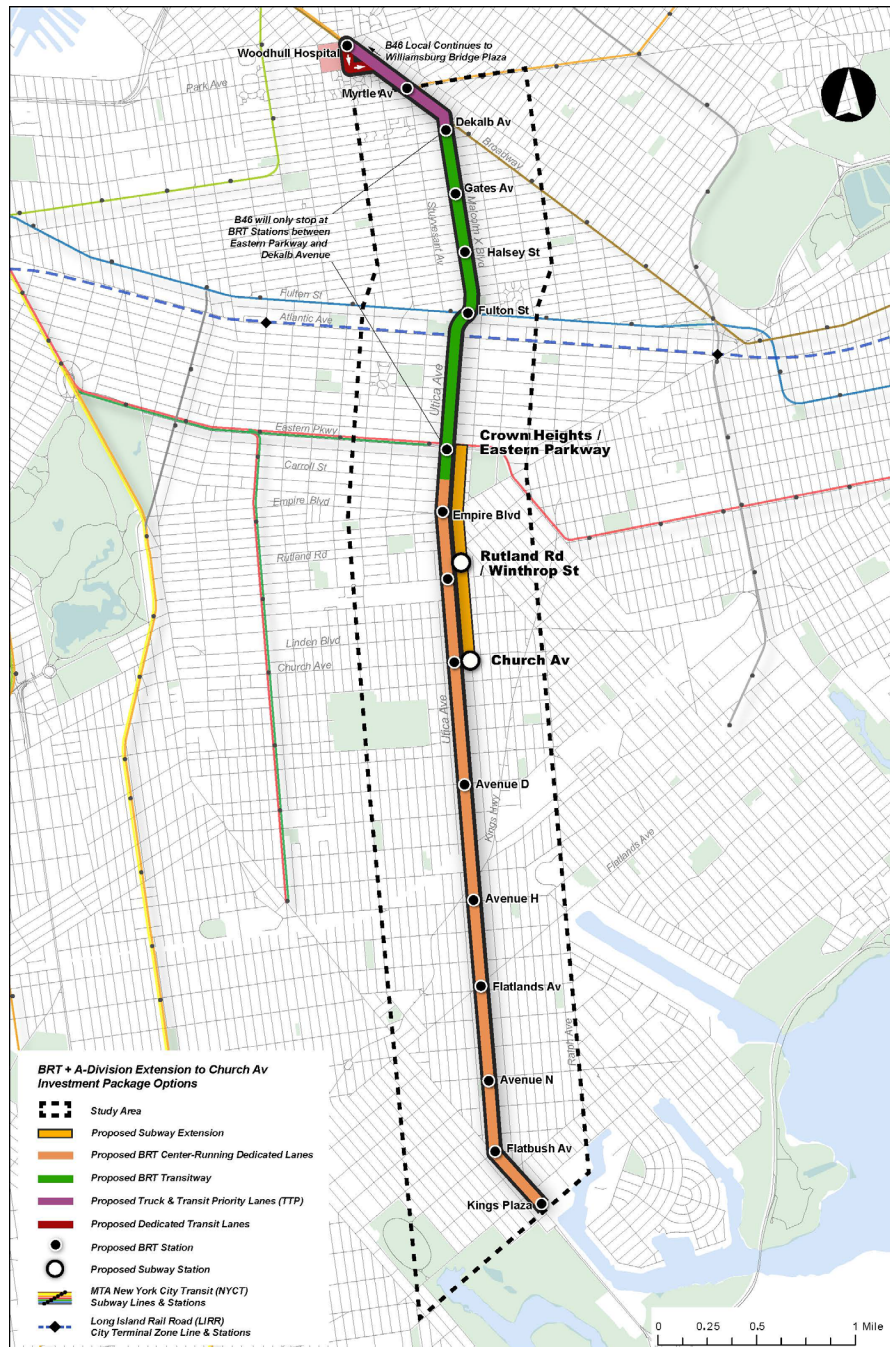
Figure 10: IPOs #8 - #9: B-Division Shuttle Along Utica Ave



Source: Utica Ave Study

Note: Designed to not preclude a future northward extension to Broadway

Figure 11: IPOs #10 - #13: BRT + Partial A-Division Extension Along Utica Ave



Source: Utica Ave Study

Note: A-Division Extension designed to not preclude a future southward extension to Kings Plaza

With the exception of IPO #1 (which corresponds to A-Division improvements only, supplementing the B46 SBS along Utica Ave), all of the other IPOs would include a new transit service along Utica Ave. In addition to the individual modal options represented in the Short List Alternatives, it was decided with the Steering Committee that the IPOs would also include a pairing of BRT (from Kings Plaza to Woodhull Hospital) with a partial A-Division Extension (to Church Av, not precluding a subsequent extension to Kings Plaza), as reflected in IPOs #10 - #13.

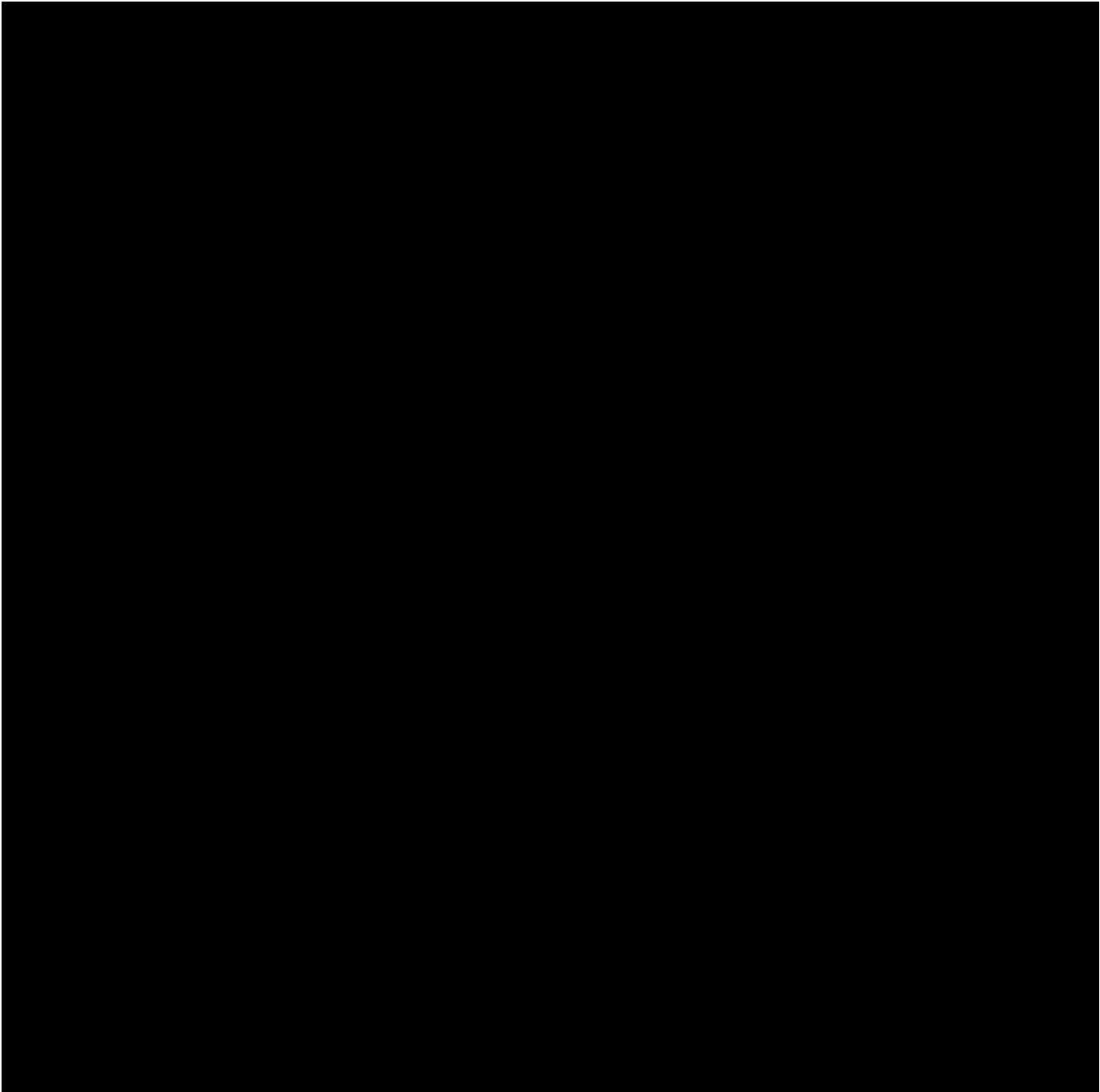
Just as most of the IPOs would include a new transit service along Utica Ave, most but not all IPOs would include A-Division improvements. Specifically, all IPOs with the Modified Hybrid Operating Plan and/or an A-Division Extension (i.e., IPOs #1, #3, #4 - #7, #9, and #10 - #13) would include A-Division improvements, and the remaining IPOs—namely, those IPOs with the CBTC Baseline Operating Plan and without an A-Division Extension (i.e., IPOs #2 and #8)—would not include A-Division improvements. The rationale for this distinction was that unlike all other IPOs, IPOs #2 and #8 would comprise a new transit service along Utica Ave (i.e., BRT and a B-Division Shuttle, respectively) that would not be dependent upon any A-Division improvements. As such, it would be possible to compare the relative benefits of IPOs #2 and #8 against IPOs #3 and #9, which include the same service along Utica Ave but also paired with the A-Division improvements.

The following section summarizes the A-Division improvements included in all IPOs other than IPOs #2 and #8.

8.2 SUMMARY OF RECOMMENDED A-DIVISION IMPROVEMENTS FOR INCLUSION IN APPLICABLE IPOs

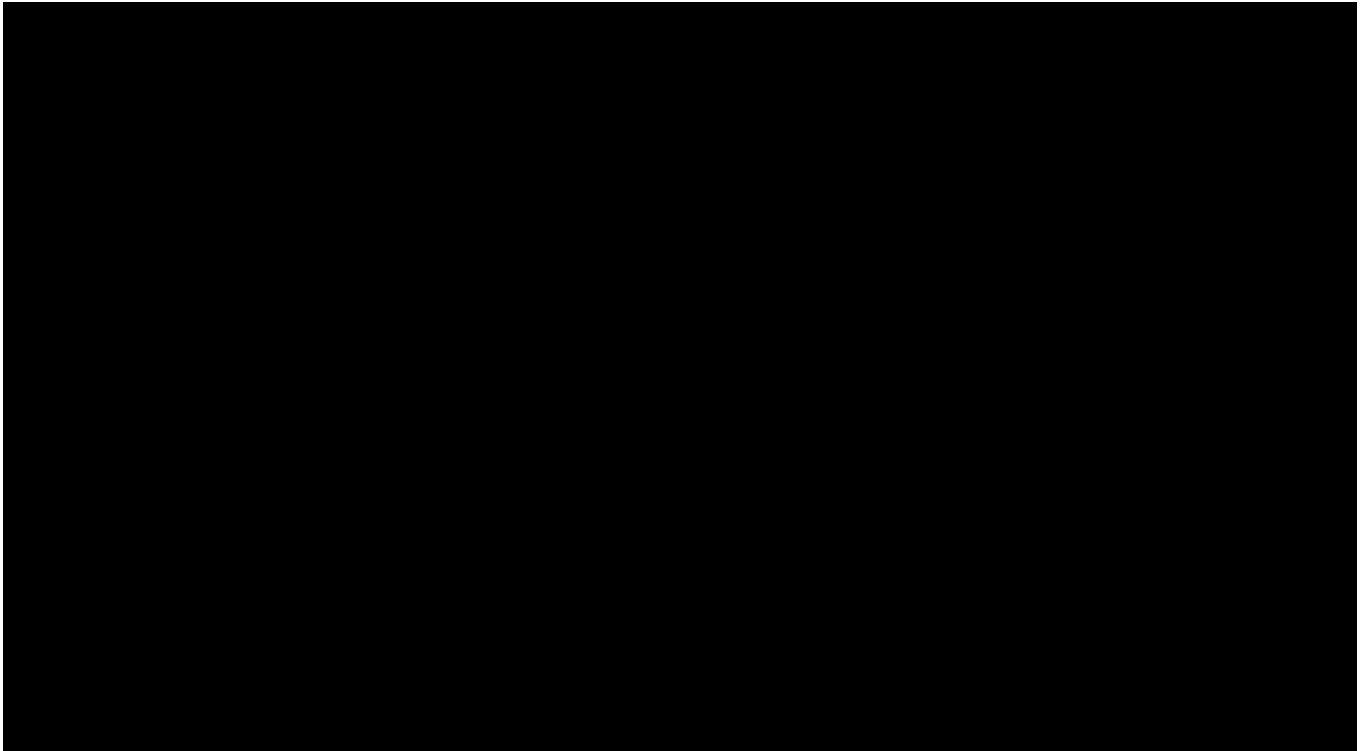
In collaboration with the Utica Ave Study Infrastructure Working Group, multiple improvement options at several A-Division locations were defined and evaluated earlier in the study, and preliminary recommendations were made for one or more improvements to advance in the study at each location (as part of Task 2). The purpose of the A-Division improvements in the study was to increase capacity and operational flexibility of the existing A-Division in Brooklyn, which could be complementary to but independent of any new transit service along Utica Ave.

As agreed upon with the Steering Committee, the A-Division improvements described below (and shown on Figure 12) were recommended for inclusion in the applicable IPOs (i.e., all IPOs other than #2 and #8 as discussed in the previous section).



¹⁸ Refer to the respective Task 2 reports for additional details about these A-Division improvements.

¹⁹ The IPOs varied with respect to the terminal location along Utica Ave, as follows: No-Build and IPOs #1 - #3, #8-#9: Crown Heights-Utica Av; IPOs #4-#7: Kings Plaza; and IPOs #10-#13: Church Av.



²⁰ Capacity for the overall Brooklyn A-Division corresponds to the total peak TPH combined for all lines terminating along Utica Ave and those terminating at Flatbush Av and New Lots Av.

9 IPO Evaluation

Following the definition of the 13 IPOs, a set of quantitative and qualitative evaluation criteria—linked to the study goals and objectives—was established to inform the selection of Final Investment Packages from the IPOs (Table 12). Certain objectives had more than one applicable evaluation criterion, and certain evaluation criteria applied to more than one objective. Additionally, certain objectives did not warrant evaluation criteria because they were not differentiators at this stage of the analysis among the IPOs.

All of the evaluation criteria were important and collectively demonstrated the extent to which each IPO achieved the study goals and objectives against the baseline of the No-Build Alternative. There were 35 evaluation criteria in total, and a representative subset of the criteria was identified that would drive the recommendations for the Final Investment Packages. These criteria are highlighted in Table 12.

The technical work to support the evaluation of IPOs was completed in Task 3, and the selection of the Final Investment Packages was subsequently completed in two steps, corresponding to the work in Task 4 and Task 5:

- Task 4: ranking of IPOs #4-#7 based on the applicable evaluation criteria for comparing different operational scenarios of an A-Division Extension along Utica Ave from Eastern Parkway to Kings Plaza; and
- Task 5: selection of the Final Investment Packages as informed by the ranking of IPOs #4-#7 in Task 4, a targeted comparison of all 13 IPOs, and the intent to offer a range of investment levels and service concepts for the Utica Ave transit improvements. This task also included ridership forecasts for the Final Investment Packages paired with three potential future Land Use Scenarios.

The overall results when applying all evaluation criteria to each of the 13 IPOs are presented in Appendix 4 (with additional backup documentation in Appendices 5-7), and subsequent reports for Tasks 4 and 5 documented the focused analysis to drive the selection of the Final Investment Packages.

Table 12: Criteria for Evaluation of IPOs

[Note: highlighted criteria were identified as those that would allow for decisions to be made among the IPOs (based on discussions with the Steering Committee) and thus drove the recommendations for the Final Investment Packages.]

Goal 1: Improve mobility and connectivity through the provision of new or enhanced transit options

Objectives	Evaluation Criteria/Metrics
1a. Reduce overall travel time for transit customers	Maximizes travel time savings from Kings Plaza to a number of representative destinations (e.g., along Utica Ave corridor, to Downtown Brooklyn, to Lower Manhattan, to East Midtown, to West Midtown) and does not make travel time worse for subway customers traveling north of Crown Heights-Utica Av Station or from other Brooklyn A-Division southern termini (i.e., Flatbush Av Terminal and New Lots Av Terminal)
1b. Improve transit reliability by reducing delays and wait time	Maximizes end terminal On-Time Performance (OTP) for subway lines to Utica Ave and avoids degrading end terminal OTP for subway lines to Flatbush Av Terminal and New Lots Av Terminal
	Maximizes end terminal OTP for overall Brooklyn A-Division
	Maximizes subway service regularity for the Brooklyn A-Division
	Maximizes service frequency for new transit service along Utica Ave and avoids degrading service frequency for subway lines to Flatbush Av Terminal and New Lots Av Terminal
	Improves free-flow bus movement by maximizing bus priority along Utica Ave (and especially in the congested segment between Empire Blvd and Fulton St)
	Minimizes the number of “long bus trips” (in terms of travel time) along Utica Ave
	Improves overall transit reliability for trips to, from, and along Utica Ave
1c. Provide direct service to key destinations and offer multi-modal connections with other transit services	Does the IPO offer a one-seat ride between Manhattan East Side and Kings Plaza, and if yes, what is the service frequency?
	Does the IPO offer a one-seat ride between Manhattan West Side and Kings Plaza, and if yes, what is the service frequency?
	Does the IPO maintain one-seat ride connectivity to Manhattan West Side and East Side from Flatbush Av Terminal? If no, is the loss of a one-seat ride mitigated by other service improvements (e.g., frequency, reliability)?
1d. Provide additional travel options along the corridor	Does the IPO introduce a new transit service along Utica Ave, and if so, does it serve the entire corridor as currently served by the B46 SBS?
1e. Increase transportation system capacity to accommodate future growth	Increases transit capacity along Utica Ave
	Reduces crowding (or avoids overcrowding) of transit customers on Utica Ave
1f. Increase transit ridership	Maximizes ridership on the new Utica Ave service
	Maximizes new transit riders
	Maximizes total transit ridership
1g. Provide equitable transportation services	Maximizes total trips by transit-dependent persons (i.e., trips by lowest income market segment in ridership model)
	Serves Environmental Justice communities along Utica Ave
1h. Provide a transit service that offers a high-quality customer experience	No additional evaluation criteria defined for this objective — already addressed with evaluation criterion 1b
1i. Accommodate pedestrian and bicycle circulation	Does the IPO improve pedestrian/bicycle access at Eastern Parkway by creating additional transfer locations to the A-Division along Utica Ave?
1j. Improve safety for all roadway users to complement Vision Zero initiatives	No additional evaluation criteria defined for this objective — already addressed with evaluation criteria 5a / 5b

Table 12: Criteria for Evaluation of IPOs (Continued)

[Note: highlighted criteria were identified as those that would allow for decisions to be made among the IPOs (based on discussions with the Steering Committee) and thus drove the recommendations for the Final Investment Packages.]

Goal 2: Maximize consistency with local and regional plans

Objectives	Evaluation Criteria/Metrics
2a. Maximize consistency with the strategy of <i>OneNYC</i> to prepare New York City for the future	Maximizes consistency with the goals and initiatives of <i>OneNYC</i>
2b. Maximize consistency with the <i>Fast Forward Plan to Modernize NYCT</i>	No evaluation criteria defined for these objectives — not a differentiator among IPOs at this stage of analysis
2c. Maximize consistency with the vision and strategic framework of the New York Metropolitan Transportation Council (NYMTC) Regional Transportation Plan (RTP)	
2d. Maximize consistency with other transportation and land use initiatives along the Utica Avenue corridor and throughout the region	Minimizes the extent to which the capital cost would warrant consideration of alternative funding mechanisms (e.g., associated with a rezoning)

Goal 3: Enhance access to employment and activity centers and support economic growth

Objectives	Evaluation Criteria/Metrics
3a. Serve existing and future population and employment centers	No additional evaluation criteria defined for this objective — already addressed with evaluation criterion 1d
3b. Support economic development along the corridor	Maximizes reverse peak trips to Utica Ave
3c. Enhance opportunities for reverse commuting to the corridor	

Goal 4: Maximize operational and cost effectiveness

Objectives	Evaluation Criteria/Metrics
4a. Offer flexibility to adapt and tailor service to accommodate changes in demand over time	Enables a phased implementation strategy
	Enables subway service design alternatives not available with existing infrastructure
	Enables flexibility of service design by offering opportunities for entering/exiting the guideway at multiple locations along the alignment
4b. Implement transit improvements whose capital and operating / maintenance (O&M) costs are warranted based on anticipated ridership	Minimizes estimated capital cost and capital cost per new rider trip
	Minimizes estimated incremental annual O&M cost and incremental O&M cost per new rider trip
4c. Make use of existing and planned transportation system services, capacity, and maintenance facilities	Minimizes the need for (and corresponding capital cost of) ancillary improvements
4d. Avoid conflicts with existing and planned transportation operations and infrastructure, including truck routes and emergency routes and services	No additional evaluation criteria defined for this objective — already addressed with evaluation criteria 5a / 5b
4e. Enable operational improvements elsewhere in the transit network	Improves Nostrand Junction operations
	Improves Crown Heights-Utica Av Station operations
4f. Implement transit improvements within a reasonable construction timeframe	Minimizes construction duration
4g. Enable opportunities to pursue phased implementation to align with available funding	No additional evaluation criteria defined for this objective — already addressed with evaluation criterion 4a
4h. Enable the use of a broad spectrum of funding sources	No evaluation criteria defined for this objective — investigation of funding sources deferred to a subsequent phase of study per NYCT direction

Table 12: Criteria for Evaluation of IPOs (Continued)

[Note: highlighted criteria were identified as those that would allow for decisions to be made among the IPOs (based on discussions with the Steering Committee) and thus drove the recommendations for the Final Investment Packages.]

Goal 5: Minimize adverse environmental impacts

Objectives	Evaluation Criteria/Metrics
5a. Avoid construction impacts that adversely affect the natural and built environment	Minimizes potential adverse impacts to the natural and built environment during construction, and avoids disproportionately high and adverse effects on Environmental Justice communities
5b. Implement transit improvements that are operable without adversely affecting the natural and built environment	Minimizes potential adverse impacts to the natural and built environment during operation, and avoids disproportionately high and adverse effects on Environmental Justice communities
5c. Reduce automobile usage	Maximizes reduction in vehicle miles traveled (VMT)
5d. Reduce air emissions	

Goal 6: Implement adaptive transit improvements that can maintain or quickly restart operations

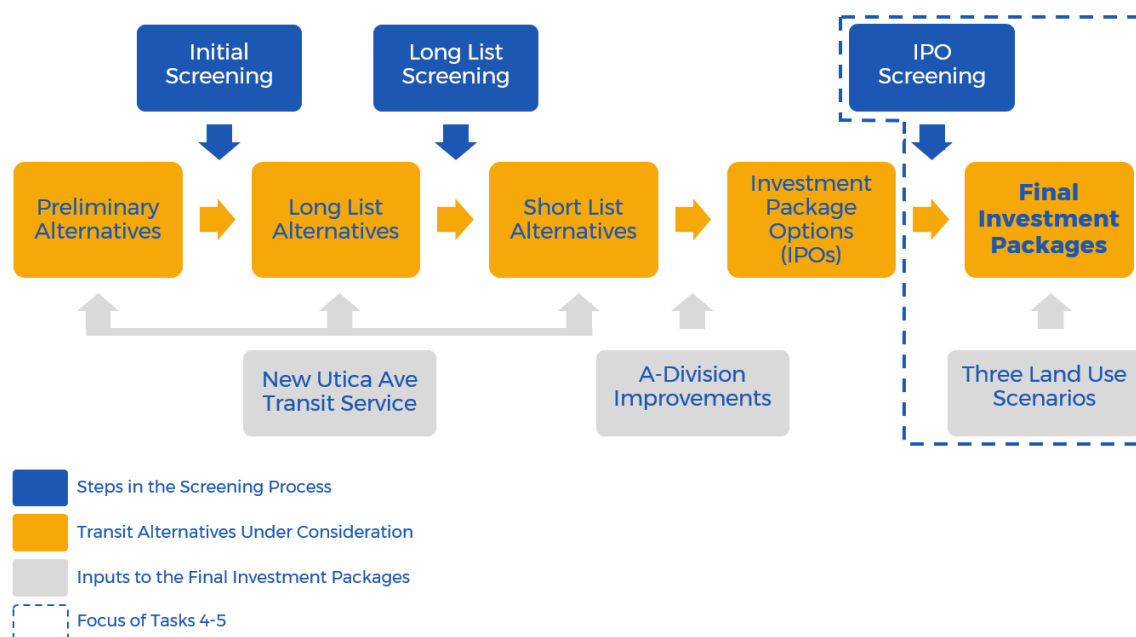
Objectives	Evaluation Criteria/Metrics
6a. Implement adaptive transit improvements that can maintain or quickly restart operations	<i>No evaluation criteria defined for these objectives — not a differentiator among IPOs at this stage of analysis</i>
6b. Add redundancy to the transportation system to complement improved operational responsiveness	

Source: Utica Ave Study

10 Conclusion & Next Steps

As discussed in this report, the screening of alternatives for a new transit service on Utica Ave led to the identification of the Short List Alternatives, which in turn informed the definition of 13 IPOs. The report culminated in an evaluation of the 13 IPOs across 35 criteria linked to the study goals and objectives. In coordination with the Steering Committee, a subset of the evaluation criteria was identified that would drive the decision about which of the 13 IPOs would comprise the Final Investment Packages. The subsequent work in Tasks 4 and 5—shown inside the dotted line on Figure 13—documented the process of selecting the Final Investment Packages, with the intended outcome of a wide range of investment levels and concepts for improving transit service along, to, and from Utica Ave.

Figure 13: Alternatives Development & Screening Process — Remaining Steps to Select & Evaluate Final Investment Packages (in Tasks 4-5)



Source: Utica Ave Study

Note: Building upon the work in Task 3, the work in Tasks 4-5 reflected the steps of the alternatives development and screening process inside the dotted line of this graphic.